Two Sections—Section One

Railway Age

WITH WHICH IS INCORPORATED THE RAILWAY REVIEW

FIRST HALF OF 1927—No. 39 NEW YORK—JUNE 25, 1927—CHICAGO SEVENTY-SECOND YEAR

SYMINGTON

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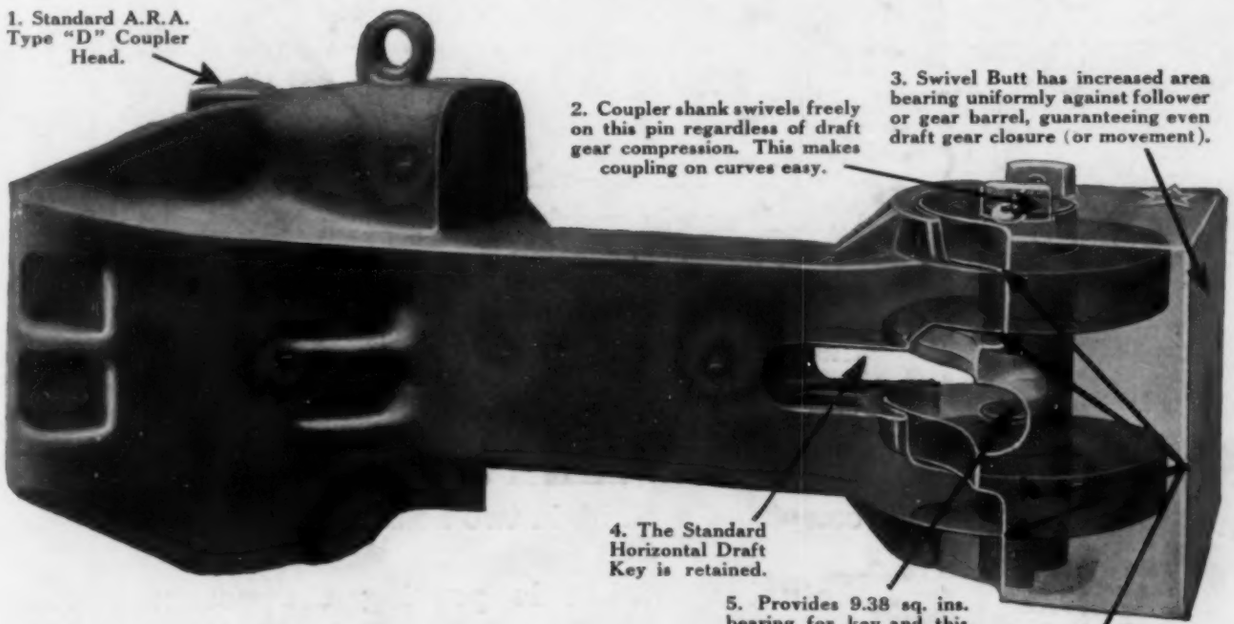
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See Pages 14 and 15

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Alphabetical Index to Advertisers Page 62 Classified Directory of Advertisers Page 58

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Volume 82 **Number 30**
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Railway Age

Vol. 82 June 25, 1927 No. 30

A Freight Train on the Tasmanian Government Railways

Contents

Reading Provides New Car Repair Terminal.....Page 1989

A description of the improvements which include a large freight shop, a passenger car paint shop and a modern engine layout.

Freight Claim Rules Changed at Annual Meeting..... 2002

A report covering the annual meeting of the Freight Claim Division of the A. R. A. at Quebec.

The Frisco's Experience with Lacquer..... 2013

A discussion of the experience of this road in using Duco for two and one-half years.

EDITORIALS:

Railroad Students of Germany and England..... 1985
W. J. Harahan and the Younger Men..... 1985
Why Reluctance in Making Surprise Tests?..... 1985
The Permanence of Pole Lines..... 1985
A New State Capitol at Railroad Expense..... 1986
Empty Car Miles and Business..... 1986
Draft Gear Endurance..... 1986
What Constitutes Bus Line Profit..... 1986
Thirty Miles a Day..... 1987
Slow Progress on Moffat Tunnel..... 1987
Are Four Billions of Actual Investment to be Confiscated?.. 1987

GENERAL ARTICLES:

Reading Provides New Car Repair and Terminal Facilities. 1989
Southeastern Firemen Awarded Wage Increase..... 1984
I. C. C. Investigates W. & L. E. Stock Purchase..... 1985
Great Northern Electric Locomotives..... 1987

GENERAL ARTICLES—Continued

Stabilization of Employment..... 1989
Freight Car Loading..... 2001
Freight Claim Rules Changed at Annual Meeting..... 2002
Supply Officer Takes Stand Against Arbitrary Purchasing... 2006
Decapod Locomotives for the Western Maryland..... 2007
C. & O. Hearing Concluded..... 2009
Frisco's Experience with Lacquer..... 2013
All-Steel, Ball-Bearing, Induction Motors..... 2015

NEW BOOKS..... 2016

LOOKING BACKWARD..... 2016

ODDS AND ENDS OF RAILROADING..... 2017

NEWS OF THE WEEK..... 2018

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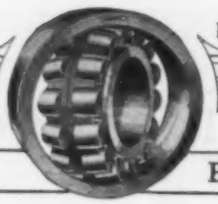

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Railway Age

Vol. 82, No. 30 June 25, 1927 Table of Contents Appears on Page 5 of Advertising Section

The Railroad Students of Germany and England

A PARTY of 100 railroad men from Germany, not the executives of German roads, but the younger men —the students and junior officers—has recently completed a trip of inspection over the English railways as guests of the Railway Students Association of the London School of Economics. Both the visitors and their hosts make up the class of men from which will come the higher railroad officers of tomorrow, and it seems fortunate that they are preparing for their responsibilities in one of the best possible ways. Railroad problems in Europe differ nationally much more, say, than do the problems of the United States and Canada. A realization on the part of these future railroad officers of Germany and England that one of the best ways to prepare for their jobs is to gain a wider understanding of railroading under as many varied conditions as possible, and at the same time to learn how the problems that arise from the varied circumstances are met, seems a praiseworthy course. An emulation of this example in other European countries might conceivably do much to promote such cordial international relationships as prevail between the United States and Canada, to the great profit of all concerned.

W. J. Harahan and the Younger Men

THE third Younger Men's Conference of the Chesapeake & Ohio and the Hocking Valley was recently held at Huntington, W. Va. A different group of young men have been touched by each of the three conferences; they come from every department of the railroad and a careful and thorough follow-up system has been devised to insure conserving the full value of the conferences. Incidentally, interest in this follow-up has been stimulated by the large number of officers who have attended the meetings as visitors or vocational advisors. As a result the officers and supervisors over the entire system are taking a greater interest in the selection and development of the young men under their charge. Are such system conferences and programs really worth while? Do they pay? A feature of the Chesapeake & Ohio and Hocking Valley Employees' Magazine is a monthly, full-page, prominently displayed message from President Harahan. The one in the June number comments on the Younger Men's Conferences. The following quotation gives some idea of the conclusions of the chief executive with respect to this movement. "I have come away from each of the three Younger Men's Conferences feeling fresh confidence in the future of this system of ours. * * * When these conferences first were inaugurated I naturally had high hopes that they would prove worth while; that the results—the apparent results—would justify the cost in time and effort expended, and I am glad to feel that the results have proven the genuine worth of the gatherings."

Why Reluctance in Making Surprise Tests?

JUNIOR operating officers, when they are promoted from the ranks, often find rather distasteful that part of their duties which includes the making of "surprise" tests. Is there any good reason for this feeling? The surprise test resembles to some extent the inspection in the army, although it necessarily cannot be announced in advance. If such tests are held frequently enough, however, so that employees may expect them at any time they lose their element of surprise and any odium which may attach to "under cover" procedure. A trainmaster of whom we have heard expressed himself as having disliked to make these tests at first but that now, making regularly 200 of them each month, the force had been brought up to such precision in performing its duties that he felt the tests entirely justified. If there are operating rules which are not based on reason they should be modified or abolished. However, while they remain they should be obeyed to the letter, and no means of securing this obedience can surpass a consistent policy of tests.

The Permanence of Pole Lines

THE extensive use of timber for pole lines in years past has made such heavy demands on the available supply of suitable species of wood that costs have increased to a degree which has forced the railroads and other pole-using companies to secure more permanent construction. With mounting costs of material and labor it has been possible to justify the greater cost of more permanent construction by reason of the longer life and correspondingly lower cost per year of service. The majority of the railroads that have recently constructed pole lines in connection with automatic signal and train control installations have used pine poles creosoted full length. A few other roads, because of location and local conditions, prefer to continue the use of chestnut, using only the butt treatment, while perhaps too many roads are continuing the use of non-treated short-lived poles. Other types of permanent construction that are receiving increased consideration are the steel truss pole and the hollow reinforced concrete pole. The necessity for continuity of service for train dispatching and signal control circuits is self-evident. But in recent years the through circuits for message and conservation service are becoming increasingly important. All of these circuits are tied in with the operation of each individual

division and cannot be detoured, if the line fails, as is the case with through commercial routes. Therefore, the railroads must give more thought to the use of modern pole materials in new or rebuilt lines in order to secure strong construction that will withstand storms and sleet loads for years as well as reduce the cost of replacements.

A New State Capitol at Railroad Expense

WEST VIRGINIA has ambitious state building plans. Like most state and local governments it likes monumental structures and right now is planning a new main building for its capitol group at Charleston. But where is the money to come from? Some fertile brain has hit upon an idea and presented it at a session of the committee on taxation of the state legislature. This plan would place the burden on the railroads. The political sagacity of this proposal at once becomes apparent from the following (we quote from the Baltimore Sun): "The House committee was told that in raising funds for completing of the capitol effort should be made to equalize taxes and that the railroads were much more equal to the task of bearing the burden than the farmers, house owners and other property holders. It also was brought out that by imposing the tax on the railroads the members of the legislature would be living up to their promises not to impose heavier taxes on the voters." This logic is probably quite irrefutable to a certain type of politician. However, it may be hoped that others bred up in the good old American theory that "taxation without representation is tyranny" will insist that a fairer method be found of meeting the demands for funds. Many observers are pointing out the rapid increase in the expenditures of state and local governments and the potential danger of extravagance. If some plan of financing such work is hit upon which will apparently cost the ordinary voter nothing, the danger of reckless spending will increase many fold. We earnestly hope, therefore, that the bright idea reported from Charleston may be stillborn.

Empty Car Miles and Business

THE steady increase in empty car miles has been a noticeable item in operating statistics these past few years. Such mileage is, of course, non-productive and expensive in itself, yet this increase need not necessarily be viewed with alarm. Regarded as an isolated item, without relation to other factors, such increase seems wasteful and indicative of inefficiency, but a more careful analysis of all the relevant data will explode this theory. Experience indicates not only that empty car miles are likely to increase as business increases, but that their ratio to loaded car miles is likely to be higher in a period of heavy traffic when the railways are rendering adequate service than when there are congestions and car shortages. However, despite the fact that empty car mileage is normally a barometer of the traffic handled and the kind of service rendered, operating officers should not sit by complacently and watch the empty car miles' figures soar. There should be on each road a ratio of empty to loaded miles which, depending on business conditions at the time, would be normal for it. It is a difficult but not impossible task to arrive at this figure, which should not be established arbitrarily nor be based on ideal car distribution. It should be computed on the basis of normal, efficient car distribution, with due allowance for special conditions, such as harvesting, seasonal perishable movements and other factors which would tend to increase the ratio even under the most efficient system. Once this ratio is established, it can be made to serve as a warning signal. If the empty mileage figure begins to creep beyond what it should be, based on the ratio, an immediate investigation may be made into car distributing methods and home routing systems to determine the fault. In all, such a ratio would enable the operating executive to have readily available at all times a check on the efficiency of his department, insofar as car distribution, home routing and other kindred activities were concerned.

Draft Gear Endurance

HOW long should a draft gear continue to operate without maintenance or repairs? Should it be overhauled or readjusted at the end of a definite period, or should it be expected to last the life of the car? There is a considerable difference of opinion among draft gear manufacturers and railroad officers alike with respect to these questions and one of the tasks of the Committee on Couplers and Draft Gears of the Mechanical Division, American Railway Association, in its program of draft gear tests at Purdue University, on which it is now working, is the development of a satisfactory endurance test for the comparison of various draft gear types. Even though there may be no difficulty in developing tests which will determine definitely the relative endurance of gears of different types, it is doubtful whether a practicable laboratory test can be developed which can be translated directly into terms of years of effective service. In the meantime, in general practice all draft gears seem to be expected to perform their service indefinitely without attention, even though few railroad men would probably be willing to express the belief that the gears they buy will actually render effective service indefinitely. Furthermore, it will probably be generally admitted that a worn-out draft gear is no protection to the care and that, even though it should ultimately be possible to develop a draft gear which will not wear out, the railroads in the meantime must operate with what is available. Might it not be worth while for the American Railway Association to initiate a field investigation of draft gear conditions with a view to improving freight car protection by the development of a systematic program of draft gear maintenance based on the actual facts pertaining to the durability of present-day draft gears?

What Constitute Bus Line Profits?

THE profit accruing to a railway as a result of its operation of motor buses is not a matter solely of an excess of revenues over expenses adequate to pay interest and other charges and leave a certain amount for dividends. Even if a railway bus line is unable to secure enough business at the going rates to pay its operating expenses alone, it may still be earning a profit for the parent company. To arrive at the true financial gain, consideration must be given to the elimination of the operating cost of trains, the disuse of which was made possible by the operation of buses. This applies, of course, only in the case of the replacement of train service with bus service, and excepts those instances—a smaller number—in which railways have begun the operation of buses as a strictly supplementary service, maintaining full train

schedules. In the many cases in which the railways must continue to render service, even at a loss, the reduction of the loss incurred becomes as much of a profit as a net income from the bus operation itself. To date no railway which has undertaken bus operation has had to admit its inability to at least make a profit through a reduction of the loss that would otherwise have been incurred if the buses had not been operated and the train service had been continued.

Thirty Miles a Day

THE American Railway Association set as a goal, a few years ago, the average of 30 miles a day for the movement of freight cars. Some lines have reached that figure, while others have gone far beyond it. But much still remains to be done in this direction. The average freight car is now in actual train movement on main line tracks only 2 hours and 24 minutes out of 24 hours. One way to bring up the average is to increase the number of hours per day that the car is in actual main line train movement. Manifestly, the way to do this is to decrease the time the car spends elsewhere. An analysis of the time spent by a car on any one railway or any one division will disclose that in practically every case the car spends an entirely disproportionate amount of time in yards, earning no money and wasting money instead. A fruitful source of lost time in yards is the repair track. Most roads prepare separate statements showing the car miles, including bad order cars, and excluding bad order cars. A comparison of the two is usually illuminating. In many cases, the cars standing idle on the repair track will be found to have ruined an otherwise creditable record. Various remedies have been applied by different railroads, but probably the most efficient is to "pull" the repair tracks twice a day instead of only once. Moreover, the practice of stationing a car repair-man in every classification yard to make light repairs has been found very beneficial in increasing car miles. It is unfortunate that even on those railroads where such men are employed, any cut in the mechanical budget causes them to be among the first to be laid off. Operating officers should endeavor to impress upon the mechanical department the necessity for keeping these men on as long as business justifies their employment. It is always a mistaken policy to lay off men who are saving many times their wages in speeding up transportation and it is even more mistaken not to employ such men at all.

Slow Progress on Moffat Tunnel

WHEN the completion of the pioneer headings of the Moffat tunnel was celebrated on February 18 it was estimated that the tunnel would be completed ready for use some time during July. At that time the work still remaining to be done comprised the driving of about one-quarter mile of railroad center heading and the enlargement of about a mile of tunnel to full size, the forecast for the time of completion being predicated on the basis of current rates of progress with a possible acceleration of operations during subsequent months.

It is now clear that this forecast was too optimistic, for while statements of progress as of June 1 show that the enlargement operations have been maintained at the rate of about 600 ft. per month, the driving of the headings has gradually decreased from a monthly average of about 600 ft. to a total of 282 ft. for the month ending May 15 and only 42 ft. for the 16 days ending June 1, leaving 259 ft. of heading and 3,434 ft. of enlargement incomplete on that date. Therefore, unless progress is appreciably accelerated within a short time, it will be late in the fall before this famous tunnel project can be brought to a conclusion.

The Moffat tunnel was estimated to cost about five and one-quarter million dollars, but the "bad ground" encountered throughout a considerable portion of its length, which is responsible for the delay in its completion, has greatly increased the cost over the original estimate. With the mounting cost of this work it is significant that it represents an investment which can be justified only on the basis of its utilization as an important element in a through rail route. It is unfortunate, therefore, that the present status of the tunnel is solely that of an important physical feature of a local line of light traffic, the Denver & Salt Lake. Prospects for the establishment of through traffic have been confined to such as can be foreseen in current rumors with respect to a projected 41-mile connecting line between the Denver & Salt Lake at Orestod and the Denver & Rio Grande Western at Dotsero. It is therefore quite evident that until such a possibility is realized the completed tunnel will be in the predicament of being "all dressed up with no place to go."

Are Four Billions of Actual Investment to be Confiscated?

ONE part of the Interstate Commerce Commission's policy of valuation, which is arbitrary, unfair and dangerous in the extreme, but which has received little public discussion, is that pertaining to depreciation. The amount of "depreciation" it is deducting from the actual investment in the railways to arrive at its final valuations is so large that its policy in this regard is a matter of vital importance. There has been much discussion of the commission's refusal to give effective weight to present cost of reproduction. It is widely assumed that under the policy favored by it the valuation made would approximate the number of dollars that actually have been invested. This is extremely far from true, and the sooner it is understood the sooner there will be intelligent discussion of the commission's policy on its true merits.

The extreme radicalism of the commission's policy consists in the combination of its views regarding the way that the factors of depreciation and cost of reproduction should be treated. Theoretically at least there are both depreciation and appreciation in the value of any kind of property, and each of them may be due to various causes. The general subject of depreciation and the confusion resulting from the use of this word with different meanings have been discussed with great clarity and ability by Professor H. E. Riggs of the University of Michigan, in articles that have been published recently in these columns. (*Railway Age*, February 12, page 465; May 14, page 1461, and May 28, page 1889.) In this editorial we shall deal in a broad way only with the commission's policy regarding appreciation and depreciation as it affects on a very large scale the question of valuation as a basis for rate making.

"Depreciation" and "Appreciation"

Apparently, from the past decisions of the Supreme Court and the provisions of the La Follette valuation act,

effective weight should be given in valuation to that large increase in the value of the railways which has resulted from the increase in the cost of construction due to the advances in wages and prices that have occurred since before the war. Whether, if an adequate allowance for appreciation due to this cause were made, there should also be made a deduction for depreciation, and if so, how much, are disputed points. The railways deny there is any actual depreciation in an entire railway, if it is well maintained. If, however, a substantial allowance for increased cost of reproduction were made the valuation, even with a large deduction for depreciation, would exceed the actual investment of dollars that has been made.

What the commission's real proposed policy and methods are as to all railways are illustrated by the way it reached its final valuation of the little O'Fallon railway. While the commission talks of "cost of reproduction new as of 1914," it assumes, as a result of its investigations, that the cost of reproduction new of the property of the railways, excepting land, in 1914 would have been approximately the same as the actual investment made in them up to that time. In arriving at a final valuation it adds to this assumed actual investment to 1914 the actual investment made since that year, and then makes its deduction for depreciation. Therefore, its deduction for depreciation is in fact a deduction from the actual investment that has been made. The recorded investment in road and equipment of the O'Fallon on June 30, 1919, was $1,020,987. The commission, by the use of its own methods, concluded the actual investment had been about $967,000. From this it made a net deduction of about $216,000, or 22 per cent for depreciation, which reduced it to about $751,000. It would appear, without going into unnecessary details regarding the additions made to include land, working capital, etc., in the valuation, that if this deduction for depreciation had not been made the final value reached would have been about $1,100,000, whereas it really was $850,500, or about 23 per cent less.

A Loss of $4,000,000,000 Investment

What this means is clear enough. The commission finds that on a reproduction cost basis the valuation of the railways would be much larger than the actual investment—some 50 to 70 per cent greater. It refuses to give any weight whatever to the appreciation in value due to increased wages and prices. It finds that there has been "depreciation" due to what it calls "loss of service life" of the various elements of the properties which varies on different railways, but averages, on its theory, from 15 to 20 per cent of the actual investment in all of them, and it proposes to wipe this out in arriving at a final valuation. Nobody knows what the commission's final estimate will be of the aggregate investment that actually has been made in all the railways. Let us assume it will approximate the present book cost of road and equipment of about 24 billion dollars. A net deduction of 15 per cent from this for depreciation would amount to $3,600,000,000, and a net deduction of 20 per cent would be $4,800,000,000. On the basis of the available information it seems reasonable to estimate that its final aggregate valuation, if made according to the method favored by it in the O'Fallon decision, would be four billion dollars less than the actual number of dollars that have been invested. This would be the result of both, first, refusing to make any allowance for appreciation due to increased cost of reproduction, and, secondly, making a vast deduction from actual investment due to "depreciation."

Confiscation Disguised as Regulation?

If this vast depreciation has occurred, who is responsible for it? It is morally and legally the duty of railway managers to so manage them, if possible, that the entire investment in them will be kept intact. It is also morally and legally the duty of the government bodies that regulate them to let them, if well managed, earn enough both to keep the entire investment intact and pay a fair average annual return upon it. For twenty years the railways have been managed under an accounting system prescribed and rates fixed by the Interstate Commerce Commission. During this time there has been made in them an investment of about 12 billion dollars. The Interstate Commerce Commission has reported as earned during this time a net operating income averaging only 4.75 per cent on the investment in property reported—not even a "fair return" on any basis of computation, much less a return sufficient to compensate for a large depreciation in investment and yield a "fair return" on investment besides. And now the commission holds, in effect, that before and since its accounting system was adopted and it began to fix rates and thereby determine the net return earned and reported, there has occurred a net depreciation in the actual investment made in the railways of around four billion dollars, and that at this late day this amount of actual investment should by one stroke of the pen be written from the books and no return be allowed to be earned on it in future.

A Confiscatory Policy

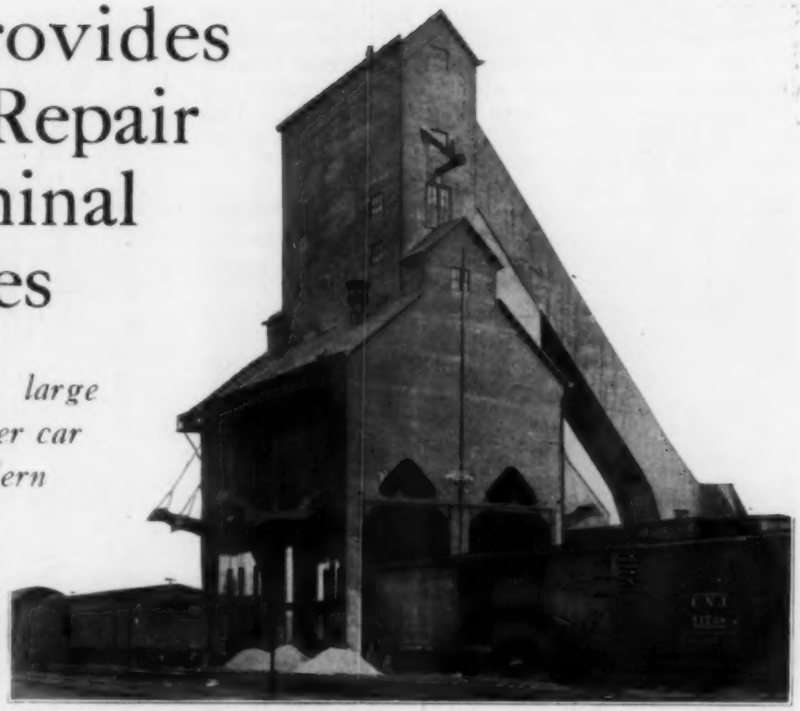
It has been repeatedly charged that the commission has followed a confiscatory policy of regulation. If its decision in the O'Fallon case is sound its regulation has caused confiscation on a grander scale than ever has been charged or even suspected. Almost one-half of the reported investment in the railways has been made since the commission began effectively to regulate their accounting, their rates and their net return. If one-half of the loss of invested capital which it claims they have sustained through depreciation has occurred during this time, they have been so regulated that they have failed during the last 20 years by an average of at least $100,000,000 annually to earn what they have been entitled to.

After a valuation has been made that will give no recognition to appreciation due to increased cost of reproduction, but which will wipe out several billions of invested capital due to alleged "depreciation," how does the commission contemplate regulating rates? Evidently in such a way as to produce a "fair return," more or less—probably less, in view of past experience—on what is left of the actual investment. There is no suggestion in the majority opinion that the rate of return allowed to be earned should be so increased as to enable the railways to get back year by year in future the huge part of their investment that, on the commission's theory, they have lost year by year in the past. The loss of investment that the commission finds has been mounting year by year is now to be made final and irretrievable.

If this does not justify the assertion that the policy of valuation and rate-regulation favored by a majority of the commission is one of "radicalism"—that it is not a policy of recognizing and protecting actual, legitimate and prudent investment, but of confiscating it on a huge scale—we are unable to conceive of what policy it or any other body could favor that would justify such a charge.

Reading Provides New Car Repair and Terminal Facilities

Improvements include a large freight car shop, a passenger car paint shop and a modern engine yard layout



The 1,000-ton Reinforced Concrete Coaling Station

AMONG the important improvement projects undertaken during the past few years by the Reading, one of the largest and most comprehensive has been the extensive construction and rearrangement of the main shops and engine terminal at Reading, Pa., which has been in progress since May, 1925. This program which involved an expenditure of $2,000,000, included the construction of a modern 128-car freight car repair shop, a 36-car passenger car paint shop, a 120-ft. extension to the already large blacksmith shop of the locomotive repair shop, and the complete rebuilding of the old engine yard and its facilities. This latter part of the work included the construction of two locomotive inspection pits, a two-track deep-quenching type cinder pit served by an overhead traveling gantry crane, and the erection of a 1,000-ton reinforced concrete coaling station. The entire project involved approximately 256,000 cu. yd. of grading, about 70,000 yd. of which was solid rock, the removal of about 5,000 ft. of old tracks and the construction of approximately 58,000 ft. of new tracks. Other work in connection with the improvements included the construction of a paint storage building, a shop office building, two small locker room units adjacent to the engine yard facilities, and the extensive rearrangement and extension of the water service lines, fire lines, etc.

The interest in this work is not alone in its magnitude and the size of each unit, but even more because of the completeness of each unit, the permanent construction employed and the carefully planned arrangement of each facility to permit more efficient operation and more intensive utilization of the terminal area. In all, the shop, engine terminal and yard facilities of the Reading at Reading cover an area of approximately 400 acres, the greater portion of which extends in a general north and south direction west of the main line and about one-half mile north of the passenger station. At this point the Reading carries on practically all of its locomotive and car repair work, this location being practically central and being the point of convergence of six branch lines.

Car Shop Is Large and of Modern Construction

The standard of equipment maintenance on the Reading having been always high, the main purpose of the new facilities, which replace or are extensions to former facilities, is to reduce the cost of main-

The New Car Repair Shop at Reading

tenance and to improve operation within the terminal.

The new freight car repair shop is the largest of the new facilities at Reading and is situated between the main line tracks on the east side of the terminal and the locomotive repair shops on the west side. This building is 880 ft. long by 335 ft. wide and has repair capacity for 128 cars at one time.

The general layout of the shop is essentially in two main parts; a main unit 235 ft. wide and the full length of the building, which is served by eight tracks and used for actual car repair work, and a secondary unit of lean-to construction, 100 ft. wide, for a blacksmith shop, a machine shop and air brake repair room, a lumber storage room, and a bench room and wood mill. This latter unit extends along the entire length of the west side of the building proper.

The exterior walls of the shop building are of brick construction, faced with a red shale brick, and rest on a concrete foundation which extends about 6 ft. above the ground level. Within the exterior walls are embedded the steel roof-supporting columns, each of which rests on a cast-in-place concrete footing, these footings extending to various depths depending upon the supporting power of the ground beneath them.

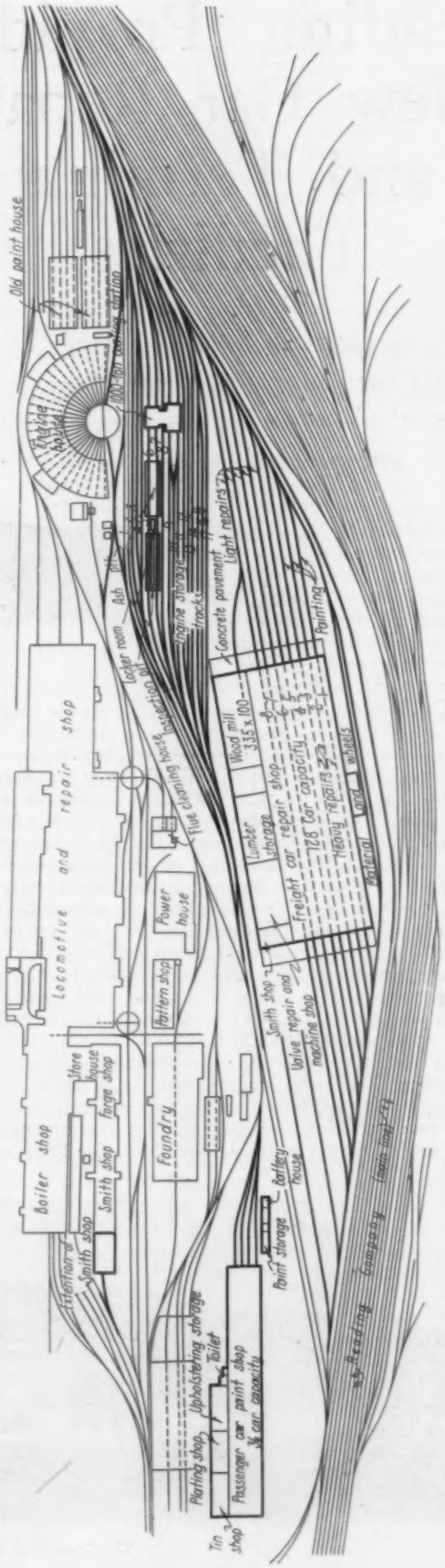
The roofs of both the main unit and the lean-to are of the high-low type with reinforced cast-in-place gypsum roof slabs resting on steel trusses, the vertical faces of all of the cross-monitors being fitted with top-hung steel sash to give light and ventilation in addition to that afforded through the large area of Truscon fixed and center-hung sash in the side and end walls.

Within the main unit of the building the floor space is occupied by the eight repair tracks and by the three rows of columns which extend lengthwise of the building. The tracks are laid uniformly 25 ft. center to center while the lines of columns are spaced 50 ft. center to center and lie between tracks No. 2 and 3, 4 and 5, and 6 and 7, the tracks being numbered from the east side of the building. The floor throughout the building is of concrete which entirely encloses the tracks with the exception of the rail heads and provisions for flangeways, the surface of the floor being level with the tops of the rails. Entrance to and exit from the building over the tracks is afforded through eight separate openings in each end, equipped with Kinnear rolling steel doors.

Shop Is Designed for All Kinds of Repairs

While the shop is built primarily for the repair of freight cars it is also used for passenger car repairs, this type of equipment being handled for the most part on tracks No. 1 and 2, track No. 1 being equipped with an inspection pit at each end of the building. As far as possible track No. 3 is used for heavy repairs while tracks No. 4, 5, 6, 7 and 8 are used for light repairs, all heavily loaded cars being placed on the latter two tracks. This general arrangement of tracks has been worked out in connection with the hoisting equipment provided, track units 1 and 2, and 7 and 8 each being served by a 50-ton electrically operated overhead crane, while track units 3 and 4, and 5 and 6 are each served by two 25-ton cranes of the same type. All of these cranes were furnished by the Niles Crane Company, Philadelphia, and are so installed that they operate throughout the length of the building on rail runways, 25 ft. above the floor, supported along the side walls and on the longitudinal rows of roof-supporting columns.

In order to permit and facilitate the use of pneumatically and electrically operated tools within the shop, air and power lines have been installed overhead along each row of columns and along the side walls, the air lines having drops with two-way outlets at each column



General Plan of the Engine Terminal and Some of the Shops at Reading—New Facilities Shown in Heavy Lines

while electric power for lighting or the operation of tools can be tapped from special Crouse-Hinds receptacles located at every other column. In addition, the shop is piped throughout with an oxy-acetylene distribution system. This installation consists of three pipe lines along the side wall and each row of columns; one 2-in. pipe to carry the oxygen supply, a ¾-in. line to carry acetylene and a ¾-in. drip line. Drops from this system are provided at every third column and at corresponding intervals along the side walls. This system was installed by the Oxweld Acetylene Company, Chicago, which company also erected a small generating plant just southwest of the shop from which it will supply oxygen and acetylene for the system.

As previously mentioned, the auxiliary car shop facilities are housed in the 100-ft. lean-to constructed integral with the main building along its west side. These include a blacksmith shop, 60 ft. long, an air brake repair and machine shop, 195 ft. long, a lumber storage room, 202 ft. long, a bench room, 80 ft. long, and a wood mill 335 ft. long. All of these units are equipped with concrete floors and are separated from each other and from the main shop by brick walls with suitable door openings, the only exception to this being the lumber storage room which opens directly into the main shop along its full length. Each of these shop units is fully equipped with modern machinery while the wood mill is served by a stub track which enters the building at the north end through an opening fitted with a rolling steel door similar to the car entrance doors in the main shop.

Lavatory Facilities Unusually Complete

In order to afford maximum convenience to shop employes and to preclude interruption in their work, drinking fountains and urinals have been installed at frequent intervals throughout the building, the urinals being enclosed by metal shields. These facilities supplement a large and well equipped lavatory which is housed in a separate lean-to on the east side of the building. This room is about 100 ft. long by 25 ft. wide, with an asphalt mastic floor and brick walls which enclose large sections of steel sash. Steel sash are also provided in the intermediate wall between the lavatory and the main shop so that the location of the room shuts off a minimum of daylight from the tracks immediately adjacent to it.

The special features of the lavatory, which is unusually light and sanitary in appearance, are the large number of toilet facilities provided and the installation of twelve 54-in. Bradley wash fountains, each of which will accommodate 10 men. This will make it possible for more than 100 men to wash conveniently at one time, which is of some importance when it is realized that the new shop will employ 800 to 900 men when in full operation.

Paint Shop Will Hold 36 Cars

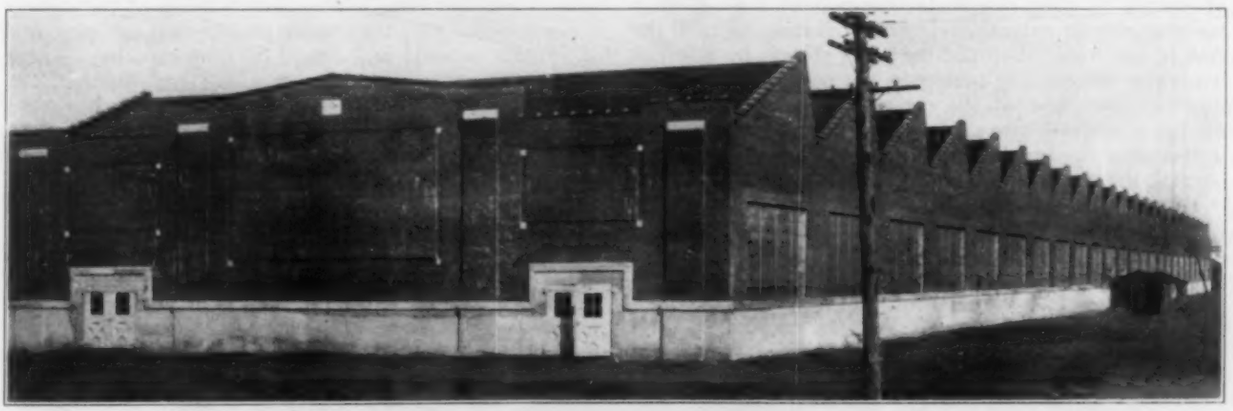
The new paint shop which is now nearing completion, is located about 900 ft. south of the car repair shop.

Looking Through One of the Large Bays of the Car Repair Shop

This building is made up of a large unit and a small unit, in much the same manner as the car repair shop. The larger unit, which is 740 ft. long by 100 ft. wide, is served by 4 tracks and used for the actual painting of cars, while the smaller unit, 390 ft. long by 50 ft. wide, is divided into separate rooms to house the auxiliary paint shop facilities.

Both of these units are of brick construction with concrete foundation walls and floors, and with steel wall and center columns supporting the roof structure which, in the case of the main shop, is of saw-tooth construction and in the auxiliary shop is of the monitor type. As with the car repair shop these roofs are made of cast-in-place gypsum slabs with a waterproofed deck, and are fitted with large areas of steel sash to supplement the daylighting afforded by the large sections of sash in the outside walls.

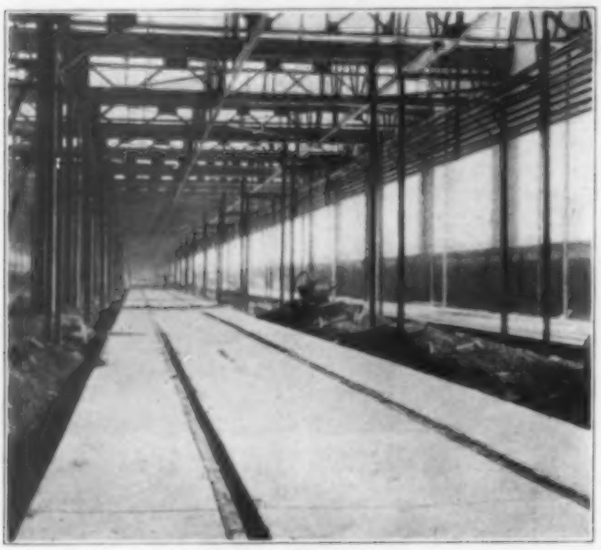
The four tracks serving the paint shop enter the building through openings in the north end fitted with



The New Passenger Car Paint Shop Has a Floor Area of Approximately 93,500 Sq. Ft.

Kinnear rolling steel doors, and are stubbed 15 ft. from the south end of the building. These tracks are spaced 20 ft. center to center and have a total capacity of 36 cars. On either side of the tracks, structural steel end supporting guides are installed for the movable scaffolding which serve both sides of all of the tracks. These scaffolds are operated through chain hoists by one man, either from the floor or from the scaffolds themselves.

The facilities housed in the auxiliary shop unit, which is integral with the west side of the main shop, include a tin shop, 120 ft. by 50 ft.; a plating shop, 120 ft. by



One Side of the Paint Shop Just Before the Floor Was Completed

50 ft., within which is located a cleaning room and a buffing room; an upholstering shop with a scrubbing and drying room, 150 ft. by 50 ft.; and several small rooms for storage and for supplies. The lavatory of the paint shop occupies a room exterior to the two shop units but integral with them at their intersection at the south end. Like the similar facility of the car repair shop, this room is light and sanitary and in addition to having the usual lavatory facilities, is equipped with four Bradley wash fountains.

Daylighting of the entire paint shop is afforded through the large areas of sash in the side walls and roof, while artificial lighting is accomplished by a carefully planned layout of electric lights with reflectors suspended from the roof structures, and by the provision of electric lighting receptacles throughout the buildings for plugging in extension circuits. Heating of both the freight car repair shop and the paint shop is by a forced hot water system originating in the power house at the terminal just west of the car repair shop. Pipe lines from the power house extend into the car shop through a concrete pipe tunnel 5 ft. wide by 6½ ft. high laid beneath the tracks in this vicinity, and two 8-in hot water heating mains are carried overhead from the car shop on heavy I-beam towers to the paint shop 900 ft. distant.

New Engine Yard an Important Addition

The new engine yard lies just northwest of the new car repair shop and occupies the space between this building and its lead tracks at the north end, and the engine house. This yard consists of 17 parallel tracks with leads at each end, and also a new south end lead to the engine house turntable. This arrangement provides greatly increased flexibility in handling locomotives, as compared with the old arrangement where there was little continuity of movement of locomotives into and out of the engine house and where all of these movements were made over the one north end lead to the turntable. It also made possible the more intensive use of the space available within the terminal area, permitting the construction of the new car repair shop where it is located, and furthermore, it provided the additional trackage and made possible the construction of the new engine yard facilities necessary at Reading where about 60 locomotives are turned every 24 hours.

Within the new yard, the tracks of which are numbered from 1 to 17 consecutively, beginning with the most westerly track, are the new inspection pits, the new ash pit and the new coaling station, all of which have been located over tracks 6 and 7 with respect to incoming engines. Of the other tracks in the yard, No. 1 and 2 are used as thoroughfare tracks, No. 5 as an engine storage and auxiliary coaling track, and tracks No. 9, 10 and 11 as coal storage and delivery tracks, while the remaining tracks are used exclusively for the holding of power and the storage of locomotives.

As most of the engines handled at the Reading engine house are released to the south of it and approach it from that direction, the new engine yard facilities have been lined up to receive engines from that direction. Thus, an engine on its way to the house uses track No. 6 or track No. 7, on either of which it passes first over an inspection pit, then on to the ash pit and to the coaling station, all three of these facilities being located within a distance of about 550 ft.

Coal Storage Bins of Special Design

The most important of the engine facilities is the new coaling station, which is a reinforced concrete structure of 1,000 tons' capacity with coaling aprons serving four tracks. While not unusually large, this station is of special interest because of the fact that it provides for the handling of both anthracite and bituminous coal and the mixing, crushing and storage of the coal in practically any proportion and degree of fineness. The station is rectangular in shape and extends over tracks No. 6, 7, 8, 9 and 10. The storage and delivery unit of the station spans tracks No. 6 and 7 only, while tracks 9 and 10 are used as hopper tracks on which coal is received at the station. Track No. 8, between the two main units of the station, as before mentioned, is used as an ash removal and auxiliary coaling track, and also for the delivery of wet sand.

The coal handling equipment at the station is arranged in duplicate with two complete machinery installations, each with capacity for mixing, crushing and elevating 75 tons of coal per hour. The storage space of the station is divided into nine bins, seven of 125 tons capacity, one of 75 tons capacity and one of 50 tons capacity. These bins lie adjacent to each other along both sides of the station in line with the tracks and are of such special design that all but the 50-ton bin can discharge coal to engines on three tracks, the two tracks directly beneath the station and an outside track. The 50-ton bin, which is used for the storage of a special grade of coal for the inspection locomotive kept at Reading, discharges only to one of the outside tracks. This arrangement of bins is particularly desirable at Reading where several grades of coal are generally stored and used and where it is highly desirable to coal all locomotives received over the pits, directly under the coaling station on the pit tracks so as to avoid their additional movement to other tracks in order that they may receive the grade of coal assigned to them.

The coal hoppers under tracks No. 9 and 10, of which there are four, are of concrete construction, each 30 ft. long by 15 ft. wide. These hoppers are arranged in pairs, two under each track, end to end. Covering the hoppers is a reinforced concrete shelter which is integral with the hoist house of the station, situated between the two hopper tracks.

Under normal operation the hoppers on the outside track, No. 10, are used to receive anthracite coal, while those under track No. 9 are used for receiving bituminous coal. In proportioning the mixture of bituminous and anthracite coal, opposite hoppers feed inward, each to a 2½-ton standard Schraeder measuring feeder which by proper adjustment can be made to discharge a predetermined amount of coal at one time. In both of the separate hoisting installations opposite feeders discharge their contents simultaneously into a 2½-ton hoisting bucket as the bucket reaches the bottom of the coal pit. After a predetermined interval of about eight seconds in this position, during which time the bucket is loaded, the bucket is raised automatically, closing the feeders on each side as it passes them, and carries its load up an inclined elevator shaft, which is enclosed, to the top of the station where it discharges automatically into a large receiving hopper. Meanwhile, upon the closing of the feeders by the passage of the bucket, each feeder receives a predetermined charge of coal which is held until the return of the bucket.

From the receiving hopper at the top of the station, the coal passes to a 30-in. by 30-in. Jeffrey single roll crusher where the coal is crushed and mixed and then discharged through chutes to the various bins, or if desired the coal can be by-passed around the crusher and chuted direct to the proper bins.

From the bins the coal is delivered to locomotives through 25 coaling aprons of the under-cut gate type, all of which are fitted with steam jackets to prevent freezing or clogging during cold weather. These aprons are operated by chain hoists from structural steel platforms which extend overhead, longitudinally between the supporting piers of the station.

Sanding Facilities Housed Within Station

The wet sand at the station is received in a track hopper under track No. 8 directly opposite the center of the station. From this hopper it falls by gravity on to a short belt conveyor within a deep metal trough which carries it to a cast iron elevator boot. Here the wet sand is picked up by a chain bucket conveyor consisting of a series of malleable iron buckets, 8 in. long by 5 in. wide, and is delivered to a 250-ton wet sand storage bin at the top of the station at the rate of about five tons per hour. From the wet storage bin the sand flows by gravity to a battery of three Beamer steam sand dryers with a capacity for drying 24 tons of sand in 24 hours, and then falls through screens to a 125-ton dry sand storage bin directly beneath, from which it is piped to each of the coaling tracks for delivery by gravity to locomotives as they are taking coal.

Throughout, the coaling station is operated automatically by electricity, all of the operating machinery being located in a machinery and control room which forms the south end of the hoist house. In the north end of the hoist house is a toilet for the coaling station forces and hostlers, while just south and north of the station are small brick office and locker room buildings between tracks No. 6 and 7, for these employees.

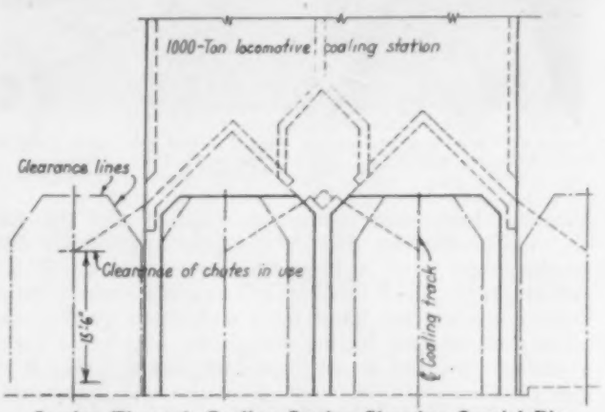
Inspection and Ash Pits

The inspection pits and ash pit at the new engine yard are located just south of the coaling station under tracks No. 6 and 7. The inspection pits are of concrete construction, 170 ft. long and 3½ ft. deep from the top of rail, and are each lighted at night by four floodlights, two lights being placed back to back at each third point within the pits just below the base of the track rails. Access to the pits is gained through a concrete well extending between them at their mid points.

The ash pit, which is of concrete construction and 155 ft. long, is of the deep-quenching type, and is so designed with battered side walls that ashes discharged from engines on either of the two pit tracks move to the main part of the pit within the inter-track space where they can be reached easily for removal. This removal is effected by means of a one-yard clam shell bucket operated from a four-ton Niles electric traveling gantry crane which is supported on structural steel towers and runways located between tracks No. 5 and 6, and 8 and 9. With this arrangement cinders from the pit are picked up by the clam shell and placed in cars on track No. 8. For operation at night, the entire layout in this vicinity is adequately illuminated by floodlights.

Improvements Include Much Other Work

While the units described are the principal new facilities constructed at Reading, many other improvements



Section Through Coaling Station Showing Special Bin Construction

and additions of a more or less extensive nature have been made at this point. The more important of these include a 120-ft. by 62-ft. brick extension to the present large blacksmith shop of the locomotive shops, the construction of a two-story brick shop office, 90 ft. by 40 ft., for the car repair department and for timekeepers, and a one-story brick paint storage and battery house, 170 ft. by 20 ft., which is divided into four separate parts.

Other work at Reading included the laying of about 2,300 ft. of 15-ft. concrete pavement about the new shop buildings, over which Fordson four-wheel tractors haul materials and supplies about the terminal; the laying of an extensive system of water service and fire lines to serve all of the new facilities; the installation of five new Poage water columns about the terminal and a heavy-duty track scale just north of the new paint shop; and the laying of several thousand feet of storm and sanitary sewers.

Unusual Grading Problem for Paint Shop

Practically all of the grading work in connection with the new facilities at Reading was necessitated by the location of the shop buildings. In the case of the car repair shop this involved the removal of some 220,000

cu. yd. of material, 70,000 cu. yd. of which was solid rock. As the rock was blasted away all of this material was removed by a steam shovel in the general leveling off of the site. With this character of foundation little difficulty was experienced in placing the walls and column piers of the car repair shop.

In the case of the passenger car paint shop however, the situation was somewhat different. The site of this shop was to a large extent an old abandoned quarry which for a number of years in the past and until recently had been used for the disposal of locomotive

Looking Over the Inspection Pits Toward the New Engine Terminal Facilities

cinders. Little difficulty was anticipated with this fill, in spite of the fact that it was generally known that sections had been burning for several years. When actual grading and leveling off was undertaken, however, a roaring fire burst forth with every grab of the clam shell bucket. In an attempt to quench the fire a constant stream of water from a fire line was played on the smoldering cinders but so intense and deep-seated was the fire, that this had little effect other than to retard the burning of the cinders on the surface. Finally, it became necessary to remove the red-hot material with a clam shell bucket which lifted it out on the ground, where it was cooled by water from the fire line. In this manner approximately 12,000 cu. yd. of burning cinders were removed from the quarry, cooled, and then rehandled into cars for disposal, the excavation in some places extending 30 ft. below the surface of the ground. With the site cleared of the burning material, after about three months of continuous effort, the hole was filled with earth secured in leveling off the site for the freight car shop. The total amount of grading required for this building amounted to about 36,000 cu. yd. of earth and cinders, little rock having been encountered.

Because of this unusual condition, the foundation wall and column piers of the paint shop, of necessity, had to be of widely varying depths, the piers directly over the fire hole extending in some cases 30 ft. or more below the surface of the ground to a firm foundation. Excavation for these pier foundations was made with clam shell buckets, forms being used for the pouring of the foundation where the depth and size of the hole made this desirable or necessary.

All of the work at Reading was planned and carried out under the general supervision of S. T. Wagner, who until January 1, 1927, was chief engineer of the Reading, and Clark Dillenbeck, now chief engineer, assisted by Otto Herold, architect, and other officers of the engineering and mechanical departments. The work in the field was in direct charge of Geo. H. Seitz, assistant engineer. The principal contractors involved in the work were the Hughes-Foulkrod Co., Philadelphia, Pa., which erected all of the new buildings; the Roberts and Schaefer Co., Chicago, which erected the coaling station and supplied all of its operating equipment; the Curtis-Grindrod Co., Philadelphia, Pa., which constructed the cinder and inspection pits; the Huffman-Wolf Co., Columbus, Ohio, which installed the water and air lines, and sewers; and Michael J. McMenamin, Philadelphia, who handled all of the grading work.

Southeastern Firemen Awarded Wage Increase

WASHINGTON, D. C.

WAGE increases averaging approximately seven per cent for firemen, hostlers and helpers on twelve of the principal railroads in southeastern territory were awarded by the board of arbitration which recently held hearings on the demands made by the Brotherhood of Locomotive Firemen and Enginemen, in a decision made public on June 20 which is effective as of May 1.

The rates of pay of firemen engaged in all road service except passenger service were increased 40 cents per basic day, and the rates of pay of all other employees involved were increased 35 cents per day. These increases were decided upon by Grafton Green, chief justice of the Tennessee Supreme Court, chairman of the board, who was chosen by the United States Board of Mediation, and W. J. Jenks, vice-president of the Norfolk & Western, while C. J. Goff, vice-president of the brotherhood, in a dissenting opinion declined to approve the increases on the ground that they were inadequate. The decision of the board was very brief, giving no discussion of the opposing contentions advanced at the hearing and no reasons for its decision.

The roads affected are the Atlantic Coast Line, Central of Georgia, Chesapeake & Ohio, Carolina, Clinchfield & Ohio, Jacksonville Terminal, Louisville, Henderson & St. Louis, Louisville & Nashville, Nashville, Chattanooga & St. Louis, Norfolk Southern, Norfolk & Western, Richmond, Fredericksburg & Potomac, and Tennessee Central. Several of the Class I railroads were not parties to the arbitration, including the Seaboard Air Line and the Southern. The request of the firemen on the latter road is now before the Board of Mediation, and it is expected that the other roads not parties to the proceeding will be asked to apply the award.

The text of the decision and of the dissenting opinion follows:

The questions submitted to arbitration are embodied in seven requests made on behalf of the employees. These requests are as follows:

1. Except as otherwise provided herein, existing rates of pay for firemen, helpers, hostlers and outside hostler helpers shall be increased $1.00 per day.

2. In freight service on steam, electric or other power weighing 250,000 lb. and over on drivers and on Mallet engines, existing rates of pay shall be increased $1.25 per day.

3. Gradations of locomotives, according to weights on drivers, to be extended to 550,000 lb. and over in freight service, with an additional increase of 25 cents per day to be applied for each 50,000 lb. above 250,000 lb. on drivers.

4. It is understood that the weight on all other power-driven wheels will be added to the weight on drivers of locomotives that are equipped with boosters, and the weights produced by such

increased weights shall fix the rates for the respective classes of service.

5. In all passenger service, the earnings from mileage, overtime or other rules applicable, for each day service is performed, shall be not less than $6.25 for firemen.

6. Existing rates of pay, in excess of standard rates, shall be increased the same amount as proposed for the standard rates.

7. Note—All arbitraries and special allowances to be increased proportionately.

The first two requests will be disposed of together. A majority of the board decides that the rates of pay of firemen engaged in all road service except passenger service shall be increased 40 cents per basic day, and that the rates of pay of all other employees involved shall be increased 35 cents per basic day. Mr. Goff does not regard this as an adequate increase, therefore dissents, and will state his views separately.

The third request as to the extension of the gradation of locomotives in freight service to 550,000 lb. with an additional increase of 25 cents per day, to be applied to each 50,000 lb. over 250,000 lb. on drivers, is denied.

The fourth request that the weight on all other power-driven wheels be added to the weight on drivers of locomotives that are equipped with boosters and the weights produced by such increased weights shall fix the rates for the respective classes of service is granted.

Responding to the fifth request as to passenger service, a majority of the board decides that the earnings from mileage, overtime or other rules applicable, for each day in service, shall not be less than $5.60. Mr. Goff does not regard this as an adequate increase, therefore dissents, and will state his views separately.

Request No. 6, that existing rates of pay in excess of standard rates shall be increased the same amount as allowed herein for standard rates, is granted.

Request No. 7, that all arbitraries and special allowances be increased proportionately, is granted.

The undersigned by their signatures certify to the correctness of the foregoing award.

GRAFTON GREEN, *Chairman*,
W. J. JENKS,
C. J. GOFF.

Dissenting Opinion

The increases awarded by the majority of this board furnish a disheartening example of the weakness of arbitration as a means of procuring just compensation for wage earners. A brief review of the record will disclose the reasons for this conclusion and will explain the necessity for an emphatic dissent.

It is almost impossible to obtain a consideration of a wage question solely upon the record made in an arbitration, because matters outside the record, including general and uninformed public opinion, always seem to affect the judgment of those to whom a particular question is submitted.

In order to avoid any misunderstanding, let me state that the neutral arbitrator in this case is a man of exceptional intelligence and unquestioned integrity, with an extended judicial experience to assist him in weighing evidence. The result of this arbitration is all the more disheartenng because the conditions were on the whole so favorable to the expectation of a just wage award.

The record shows without contradiction the following facts:

1. The dominant daily wage rate of firemen in 1926 was $5.72.

2. The average daily rate for 824,313 skilled workers in the United States, according to the latest report of the United States Bureau of Labor Statistics, in 1926, was $9.18.

3. The average increase in union wages since 1913 was shown to be over 150 per cent.

4. It was shown without contradiction that there had been an enormous increase in the average standard of living in the United States and that the average annual income per person gainfully occupied had increased from $791 in 1909 to $2,010 in 1926.

5. It was shown that the average annual income per family had increased from $2,489 in 1921 to $3,311 in 1926.

6. It was shown that during the last 20 years the revenue tons per train had increased practically 100 per cent and the average tractive power per locomotive had increased over 80 per cent, imposing on the firemen increased physical and mental labor, and greater responsibility.

7. It was shown that in this period the gross ton-miles per train hour, the standard measure of operating efficiency, had increased over 100 per cent.

8. In short, the evidence, which was not contradicted either in cross examination or by any counter evidence, showed that the value of the service of a locomotive fireman had increased approximately 100 per cent in the last 20 years and that the average prosperity and standard of living had increased approximately 50 per cent.

9. The uncontradicted evidence showed that because of the increased size of locomotives, promotion had been greatly retarded and there were 1,811 firemen furloughed from service, subject to call upon 30 days' notice.

10. The figures brought in by the railroads' own witnesses showed that the average earnings of 8,679 men amounted to approximately $129 per month.

11. To obtain a view of the average earnings of the locomotive firemen, using the figures furnished by the railroads' own witnesses, there may be eliminated from the computation 1,811 furloughed men earning nothing; 2,668 men earning less than $100 a month, and 1,279 men earning over $200 a month. The average earnings of the remaining 4,732 men, according to the figures furnished by the railroad witnesses, were $156.70 per month.

The documentary evidence presented in behalf of the employees was so accurate that not a single fact or figure so presented was questioned or contradicted. The underlying data upon which the major exhibits of the railroads were based were not produced, although demanded by the representatives of the employees from the first day of the hearing. The inaccuracy and misleading character of these major exhibits of the carriers, as revealed under cross examination, appeared so clear to one familiar with the transportation industry, that it seemed at the end of the hearing that the carriers had made no effective defense.

It should also be stated that although the reports of the carriers introduced in the record showed great prosperity, enormously increased earnings and ample ability to pay many times the increases requested, the representatives of the employees studiously refrained from basing their case upon the financial prosperity of the roads, and no issue of ability to pay or inability to pay was raised by either side. This case, therefore, was submitted on the simple, direct basis of fixing just compensation for these employees, considering the value of their service, the labor and responsibility required, the occupational hazard endured, the wages paid to similar workers and the general standard of living in the communities in which they live. Skilled workers in other lines of industry have demanded and received their share of the national income. Railway employees in the present case, instead of forcing their claims, have petitioned for justice. It appears from this award that what is economic justice is not a matter which can be safely submitted to the judgment of others.

Considering this case as submitted and the uncontradicted evidence, the increases awarded are wholly inadequate and subject these employees to unjust discrimination. Therefore, I do not agree with the decision of the majority upon the first, second and fifth requests made on behalf of the employees.

C. J. GOFF,
Member, Board of Arbitration.

I. C. C. Investigates W. & L. E. Stock Purchase

WASHINGTON, D. C.

A HEARING on the application of officers and directors of the Baltimore & Ohio, New York Central and New York, Chicago & St. Louis for authority to serve also as directors of the Wheeling & Lake Erie was begun on June 20 before C. V. Burnside, assistant director of the Bureau of Finance of the Interstate Commerce Commission. A majority of the stock of the company was acquired recently by the first three roads named and their applications are being opposed by the Wabash and the Pittsburgh & West Virginia.

G. Durham, vice-president of the Wheeling & Lake Erie, was the first witness and put into the record data regarding the traffic of the road and its interchange, after which he was cross-examined by counsel for several of the other roads. He testified that the line is competitive with the other roads involved but that they are also in competition with each other and that while it solicits traffic to be routed via its own line it does not attempt to have anything to say about how it shall be routed via its connections, except that its solicitors are instructed to point out the service available. He said he had received no intimation from any of the roads that have recently acquired a stock interest that it was desired to stop soliciting or giving good service. If it

should stop its competitive efforts, he said, in reply to questions by Clyde Brown, general solicitor of the New York Central, the community would still have the competition of the Erie, Pennsylvania and other lines.

G. H. Fillius, representing the P. & W. Va., asked if the community would not feel a loss if competition between the three roads were eliminated and only the competition of the Wheeling with the other roads were left. He replied that in such an event the roads would lose considerable business to the Pennsylvania. He was also asked if Wheeling solicitors have not recently solicited freight from Toledo and Michigan points via its line and the B. & O., as against a previous routing via the P. & W. Va. and the B. & O. He answered that they may have pointed out the service available by that route. He was asked to file a statement naming the points served by the Wheeling that are not served by the B. & O., New York Central, Nickel Plate or Erie.

W. M. Duncan, chairman of the Wheeling & Lake Erie, under cross-examination by C. F. Taplin, general counsel of the P. & W. Va., was asked to furnish a statement showing the dates and the amounts of the stock transfers to each of the three companies. He said he did not know whether any stock was transferred to the Van Sweringen brothers. Asked when the names of the new directors were suggested to him he mentioned conferences at which the B. & O., and New York Central had suggested their representatives, three each, and a luncheon with O. P. and M. J. Van Sweringen at which they suggested three names, W. L. Ross, J. J. Bernet and M. J. Van Sweringen, but the latter two were later omitted. He said these conferences were about three weeks after it had been announced in the newspapers that the three roads had bought an interest in the Wheeling but that he had previously had some information as to what had been done because he had been asked by a representative of John D. Rockefeller, Jr., to go with him in connection with the transfer of some stock. This was on the Monday following the "Wheeling Black Friday," he said.

Mr. Duncan said the trunk lines had first asserted their right to vote the Wheeling stock at the annual meeting in April. He also told of a conference attended by representatives of the three trunk lines at which he said three checks were delivered to Bertram Cutler, representative of Mr. Rockefeller. Mr. Taplin then asked that subpoenas be issued for Mr. Cutler and for O. P. Van Sweringen, saying the latter had testified at the C. & O., hearing the week before about purchases of the stock which had then been turned over to the B. & O. and New York Central so that each owned 17 per cent.

Mr. Burnside took the request under advisement.

Testimony of Daniel Willard

Daniel Willard, president of the Baltimore & Ohio, testified that the acquisition of the Wheeling stock by the three trunk lines was to perpetuate its independence in accordance with the four-system plan recommended by the commission in 1924 by the eastern executives. He said that there are absolutely no agreements or understandings between the three companies and nothing to prevent either road from selling its stock at any time, although he added there was no intention of doing so and he would regard such an act as in bad faith so long as the plan submitted to the commission remains as it is without approval or disapproval by the commission. The plan proposed that there should be four eastern systems built around the Baltimore & Ohio, New York Central, Nickel Plate and Pennsylvania, but the roads could not agree on allocation of the Wheeling to any one so joint ownership was proposed. The Pennsylvania said it was not interested, he said. The B. & O. had then bought a stock interest in the Western Maryland because Mr. Rockefeller would not sell his Wheeling stock unless the Western Maryland stock was also taken, but it was thought that desirable use could be made of it for through service via Cherry Run.

Mr. Willard was cross-examined by Mr. Fillius and others as to whether it would not be possible for the Wheeling to be so operated that freight for the West should be routed over one of the three trunk lines, or so that its effectiveness as a competitor of other roads would be destroyed. He said that he could not see why its status should be weakened because three strong lines each own an interest in it and that he did not think it would be allowed by the commission or be economically wise. When Mr. Fillius insisted on an answer as to whether it would not be "conceivable," he finally replied: "It is conceivable, if that's what you want me to say, but it is inconceivable to me that such a conceivable thing should happen." He said either of the three roads would have been glad to take all the Rockefeller holdings in the Wheeling, except that they had subscribed to the statement to the commission that it ought to be owned by the three.

Cross-Examination

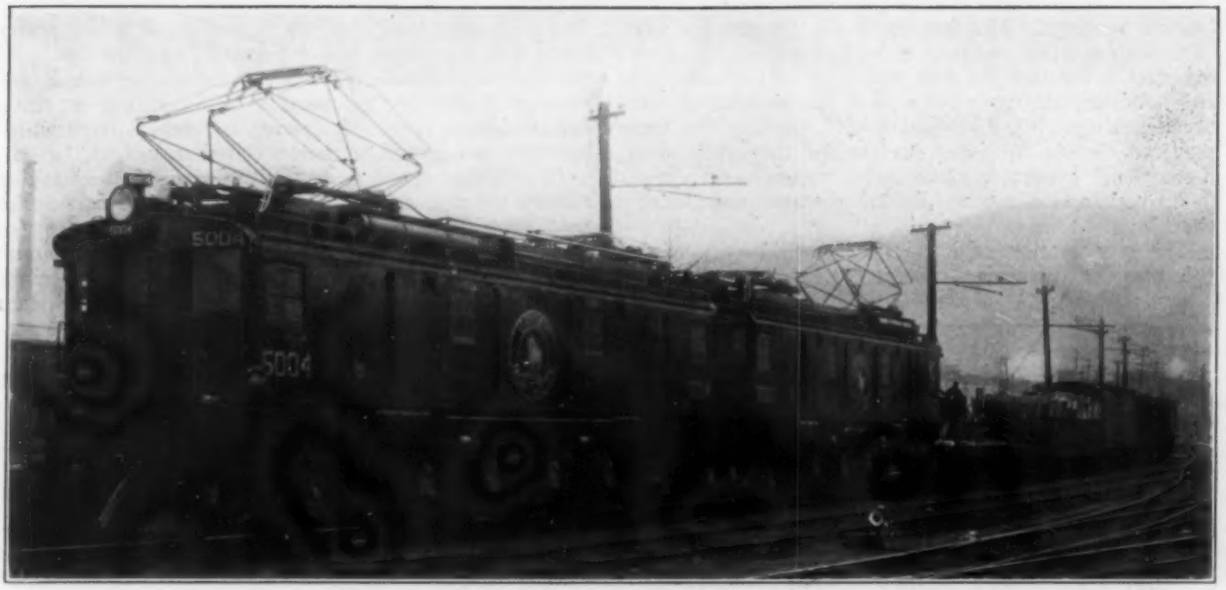
W. H. Bonneville, attorney in the commission's Bureau of Inquiry, sat with Mr. Burnside and took part in the questioning of witnesses regarding the acquisition of the stock.

Mr. Bonneville asked Mr. Willard if he would have any objection to the commission including in its order, if it approves the applications, a condition limiting its approval until the further order of the commission. J. H. Agate, assistant general counsel of the Nickel Plate, said that was the usual form of the commission's interlocking directorate orders and Mr. Willard said he understood none of the roads would object.

George M. Shriver, senior vice-president of the B. & O., described the negotiations for the Wheeling & Lake Erie stock. When asked to read from testimony by O. P. Van Sweringen at the C. & O. hearing about his purchases of Wheeling stock, which were later shared with the other two roads, he said he understood that Mr. Van Sweringen was talking about stock other than the prior preference stock which had been acquired by the three roads from Mr. Rockefeller. He said the cost to the B. & O. of its 17 per cent interest was $9,749,011, and that the prior preference stock had cost $184.90 a share and the other stock $87.21. He said he had been surprised to learn, after the roads had purchased the Rockefeller stock, that Mr. Van Sweringen had been buying Wheeling stock but that the B. & O. had been glad to take one-third of his purchases at an average cost of $41 a share. The prices indicated that the stock purchases had been made before the most sensational rise in Wheeling stock in the market.

N. S. Brown, vice-president and general solicitor of the Wabash, asked Mr. Willard why permission had not been asked of the commission by the B. & O. to acquire Wheeling stock. Mr. Willard said it was because it was not seeking control.

Testimony corroborative of that of Mr. Willard and Mr. Shriver was also given on June 22 by A. H. Harris, vice-president of the New York Central, and W. L. Ross, president of the Nickel Plate. J. W. Graham, general traffic manager of the Nickel Plate, and J. J. Ekin, comptroller of the B. & O., also testified on June 22.



One of the Two-Motive-Power Unit, 357.5-Ton, 11,000-Volt, Single-Phase Motor-Generator Locomotives

Great Northern Electric Locomotives

General description of the rotating apparatus and operating features

By E. R. Martin,
Motor Engineer, Westinghouse Electric & Manufacturing Company

THE change of the Great Northern Cascade tunnel operation from three-phase, 6,600 volts to single-phase 11,000 volts, has many points of interest. Data concerning the motor-generator locomotives (two cabs) follow:

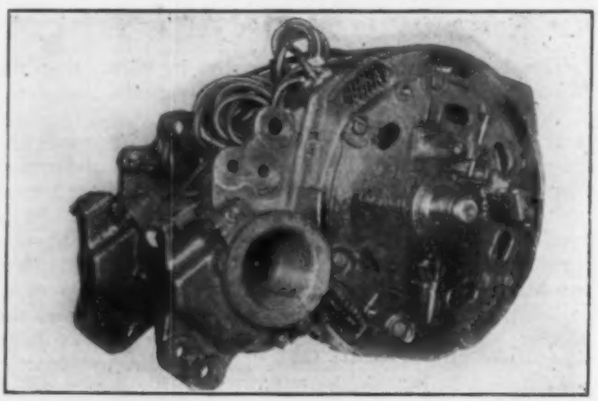
PRINCIPAL CHARACTERISTICS

Length over-all	94 ft. 4 in.
Total weight	357.5 tons
Weight on 8 driving axles	275 tons
One hour rating	4,330 hp.
Continuous rating	3,660 hp.
Speed at one hour rating (F. F.)	14.4 m.p.h.
Speed at continuous rating (F. F.)	15.5 m.p.h.

The locomotive cabs are each equipped with a 1,500-kw. motor-generator set, three blower motors, one compressor, and four traction motors. Power is supplied through a 2,000 kv-a. locomotive type transformer, which is air-cooled by forced ventilation; it steps the voltage down from 10,500 to 1,240 for the synchronous motor. The insulated secondary has two taps, 50 per cent and 75 per cent, the former being grounded through a detector.

Motor Equipment

The synchronous motor is completely wound with a lap winding, some of the coils being used to provide a two-phase voltage to combine with half the voltage of the transformer to form a three-phase supply for driving the blower motors for the transformer and main motors. The winding is specially designed for low reactance to increase the pull-out torque, which feature is also considered in designing the revolving field for high excitation. The field is four-pole, wound for 125 volts, d-c., and has a field discharge resistance for use in stopping and starting. The rotor also carries a heavy squirrel-cage winding for starting and for damping. The generator is a compensated 600-volt, d-c. machine, slightly differentially compounded, separately excited through a shunt winding from a 125-volt exciter. It has eight



Traction Motors for Great Northern Motor-Generator Locomotive Are 6-Pole, 600-Volt, 750-Ampere, 540 Hp. and Axle Mounted

poles and is well cross-connected for balancing the lap winding.

The motor and generator are bolted together with a fan housing between them. The rotor is carried by two

bracket bearings. The fan draws air through the sides of the cab and into the bearing end of each machine and exhausts it through the roof and floor of the cab. The end housings also carry the exciter frames without additional bearings. A 75-kw., 125-volt, six-pole, flat compounded exciter furnishes current for the synchronous motor field, generator shunt field, regeneration exciter field, compressor motor, lights, control, and battery charging.

The regeneration exciter is a 25-kw., 10-volt, eight-pole machine furnishing current for the traction motors

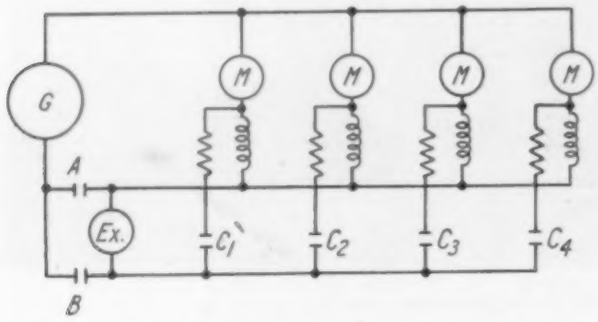


Diagram of Direct-Current Connections for One Unit

for operation during separate excitation, motoring or regenerating.

The traction motors are six-pole, 600-volt, 750-ampere, 540-hp. axle mounted, running at 460-r.p.m., full field. They are forced-ventilated, on the horizontal system, the air entering above the commutator and blowing between the field coils, through the air gap, through the round holes in the armature core, and out the rear end through the frame and housing. The armatures are lap wound and well equalized. The motors are flexibly geared at each end.

The gearing ratio is 18 to 91.

The compressor motor, rated at 35 hp., 125 volts, drives a 150-ft. compressor up to 135 lb. per sq. in. The blowers are driven by 660-volt, three-phase, four-pole, 10-hp. induction motors, one being used for the ventilation of the transformer and regeneration exciter, and one for each pair of driving motors.

Starting

The synchronous motor is started by connecting the 125-volt lead storage battery to the main generator through resistance. After this is cut out and the field weakened sufficiently to obtain about one-third speed, the motor is switched to the 75 per cent tap of the transformer and the battery disconnected. The motor comes up to speed as an induction motor and a weak field is applied at about 80 per cent speed to force it into synchronism in the proper phase relation. A reactor is then automatically connected across the 25 per cent section of the transformer, the 75 per cent tap opened, and the reactor short-circuited, thus applying normal voltage with very little disturbance. The synchronous motor runs light at a field excitation that will produce a somewhat leading power factor.

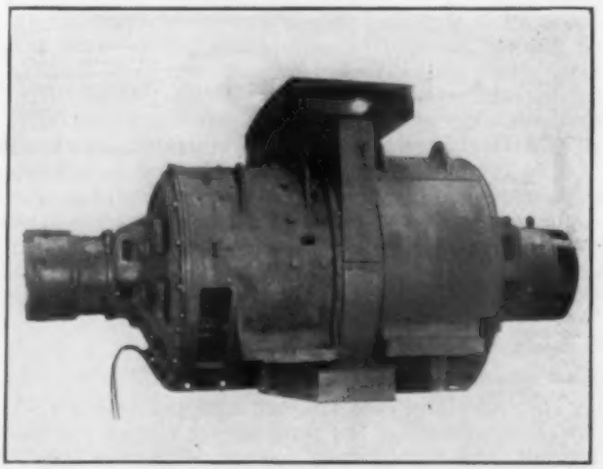
Locomotive Performance

The locomotive is started by moving the main controller handle to apply higher excitation to the synchronous motor field and give a low excitation to the generator. The main motors are all connected in parallel and start under low voltage without external resistance or changing connections. Thus, with the proper current, they will exert their full tractive effort at a low power input and at a lower power demand from the line. As the controller handle is advanced for higher speeds, the main generator field is strengthened by cutting out shunt field resistance until full voltage is reached, from which point the motors run on their series characteristic.

If a higher speed is desired, it is only necessary to balance the regeneration exciter voltage against the series field drop by varying the regeneration controller (or separate excitation controller) with the armature circuit of the regeneration exciter connected as shown in the diagram with switch *B* closed, *A* opened, and *C* switches open. When this has been done, as shown by a zero reading on a voltmeter, a push button is operated, throwing in the stabilizing resistance, and separate excitation exists with a one-to-one ratio of field and armature currents on the main motors. Stepping back on the regeneration controller will weaken the main motor fields and obtain higher speeds. Advancing the controller will strengthen the fields and reduce speed or cause the locomotive to regenerate. If the field of the main generator is reduced (when it is motoring) by returning the main controller handle, regeneration is increased and may be carried down to about four m.p.h. at full rated retarding effort; or in other words, the train can be practically stopped by regeneration.

This gives a control system of great flexibility and enables the engineman to operate the locomotive at constant horsepower output under a wide variety of conditions.

In case the synchronous motor is overloaded, a current relay applies super-excitation and reduces the voltage of the generator as a warning to the engineman.



Motor-Generator Set with 75 Kw. Exciter and 25 Kw. Regeneration Exciter, the Four Machines Being Mounted Together as a Unit

If the set is pulled out of step, it immediately drops its load and automatically pulls into synchronism ready for reloading.

The locomotive possesses the superior starting tractive effort of d-c. series motors without the disadvantage of resistor losses; it has the constant speed characteristics of the split phase locomotive with the advantage of changing that constant speed at will through a wide range for both motoring and regenerating. It also has the desirable features that it operates from a high voltage single-phase a-c. trolley with transformer substations and that it takes its energy at a high power factor.

Stabilization of Employment

Report of a Special Committee to the Association of Railway Executives

THE desirability of bringing about as great stability of employment on the railroads of this country as earnings, traffic and climatic conditions permit, is recognized in a report submitted to the member roads of the Association of Railway Executives by a special committee appointed September 18, 1924, by the association to make a study of the subject and to confer with the Interstate Commerce Commission.

The members of the special committee are: Chairman, Daniel Willard, president, Baltimore & Ohio; L. W. Baldwin, president, Missouri Pacific; H. E. Byram, receiver, Chicago, Milwaukee & St. Paul; W. R. Cole, president, Louisville & Nashville; P. E. Crowley, president, New York Central; C. R. Gray, president, Union Pacific; L. F. Loree, president, Delaware & Hudson; E. J. Pearson, president, New York, New Haven & Hartford, and Samuel Rea, retired president of the Pennsylvania.

"Your committee," said the report, "is convinced that stability of employment is invariably reflected in more efficient and economical operations, and it recommends that the carriers continue to give sympathetic and constructive consideration to this important problem not only as a matter of fairness to the employees, but also because such a policy tends to promote efficiency and economy in operation." An abstract of the report follows:

The committee met with a sub-committee of the Interstate Commerce Commission at Washington on September 30, 1924, and a general discussion of the subject took place. A joint sub-committee was thereupon appointed to make a detailed study of the matter, consisting of Dr. M. O. Lorenz, Alexander Wylie, Dr. C. S. Duncan, Dr. J. H. Parmelee, J. J. Ekin.

A questionnaire was prepared by the sub-committee and mailed to a selected list of railway executives on December 2, 1924. The sub-committee made an extended study of the matter and prepared a progress report with charts, tables, etc., which was forwarded on March 28, 1925, to the chief executives of Class I railroads, and a further report of the work of the sub-committee was forwarded on June 27, 1925, to each member of the committee of executives. The sub-committee continued to receive and compile information from a selected number of railroads until December 31, 1925. The information so assembled is in the office of Dr. Parmelee, director of the Bureau of Railway Economics in Washington.

It may be helpful at this time to review briefly the conditions which led to the appointment of a committee by the Association of Railway Executives to study the subject of stabilization of labor. It is a matter of common knowledge, among railroad men at least, that at the termination of federal control in 1920, the condition of the rolling stock of the railroads as a whole was much below the standard generally maintained before the war, and this was particularly true of the condition of the freight cars. At the same time industrial conditions throughout the United States were active and the railroads were called upon to move, and actually did move,

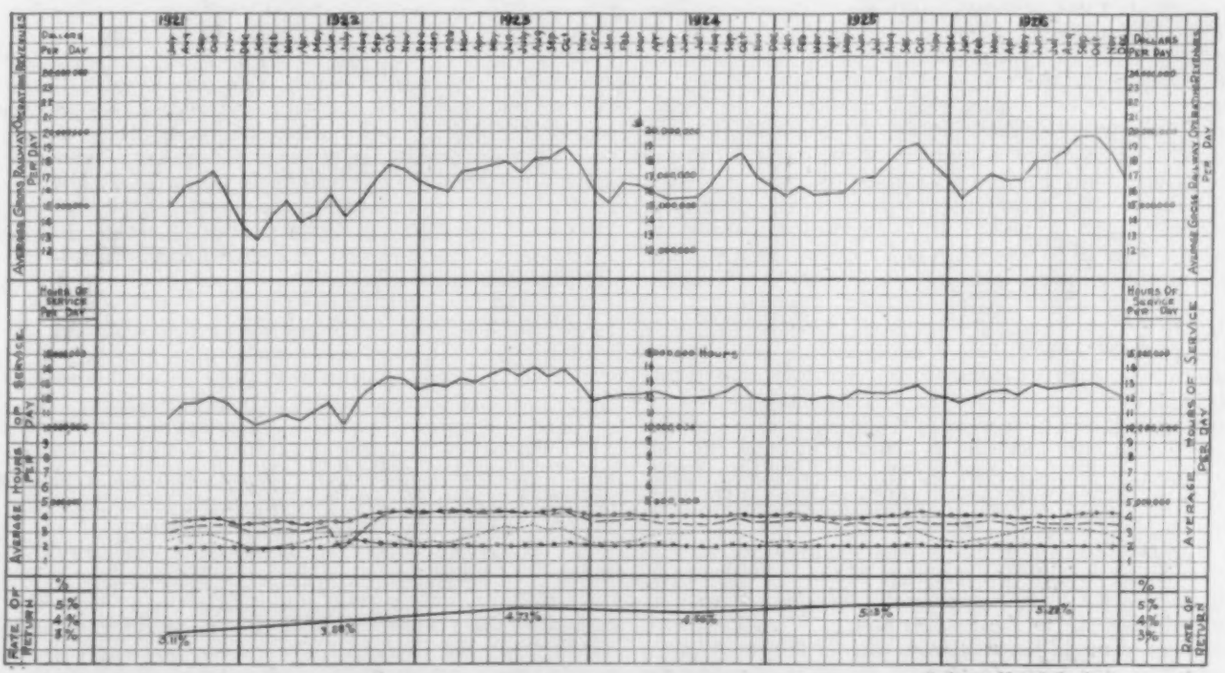


Chart Showing the Average Gross Railway Operating Revenues Per Day, the Average Hours of Service Per Day, and the Rate of Return on Property Investment for Class I Railroads, Including Switching and Terminal Companies, for the Past Five and One-Half Years.

during the year 1920 a larger volume of business than ever moved before during a twelve-month period.

In the latter part of 1920 business fell off rapidly and this decline continued throughout 1921. The operating results which the railroads were able to obtain under such changing circumstances were far from satisfactory, as indicated by the rate of return earned by the carriers as a whole upon their property investment, which was only 3.11 per cent for the year 1921.

During 1920, 1921 and 1922 labor conditions throughout the country were more or less upset, due in large part to the readjustments which were necessary after the end of the war. Strikes were of frequent occurrence; some of considerable magnitude. There was a protracted strike in the soft coal mines in 1922, and in July of the same year the mechanical forces in the employ of most of the railroads in the United States joined in a general strike.

Labor Conditions Upset After the War

During the last six months of 1922 business showed a decided tendency upwards and this continued through 1923, during which year the railroads again moved a larger volume of business than ever before. However, during all of this period the net returns of the carriers were much below the amount which had been indicated by the Interstate Commerce Commission itself as fair under the terms of the Transportation Act.

Under conditions such as have been briefly sketched, it can be readily understood why it should have appeared to many that something ought to be done to stabilize employment upon the railroads. The carriers in their effort to handle a maximum business in 1920 and 1923 felt compelled to enlarge their forces in order to make hurried and emergency repairs to equipment, and when business fell off they were forced to make prompt and radical reductions in their operating expenses even though the standard of maintenance was still low, because of the narrow margin which they were earning as a whole above their fixed charges. This condition, including of course the shopmen's strike in 1922, resulted in violent fluctuations up and down in the number of men employed by the railroads, and it was with all this in mind that a member of the Interstate Commerce Commission in the summer of 1924 suggested that while a number of railroads were endeavoring to find a solution for this problem it would be well for all the carriers to give special study to the matter. In response to that suggestion the action already referred to was taken and a committee appointed to investigate the subject.

Coincident with the events just referred to, the executive committee of the Association of Railway Executives formulated and announced a constructive program in 1923 whereunder the railroads as a whole pledged themselves to endeavor to accomplish certain results, such as a reduction in the number of bad order cars and engines and a more efficient handling of cars and locomotives in order that the railroads as a whole might be able to furnish the public a more satisfactory standard of transportation service.

The stabilization of labor was discussed informally at a number of different meetings of the executive committee and the railroads generally were urged to give individual study to the matter, and to inaugurate such practices as might be possible on each of the several lines and which would tend to stabilize employment and at the same time raise the standard of maintenance. It was pointed out that in certain portions of the country more maintenance work in connection with track and bridges could be done during the fall and winter months than had been customary in the past, and it was suggested that efforts be made to budget the maintenance work in such a way as to carry it forward as nearly as possible with uniform forces throughout the year regardless of the minor variations in the volume of business. As the condition of the equipment gradually improved and the net earnings became more satisfactory, it was possible for the carriers to arrange their maintenance forces more nearly in accord with this recommendation.

It was found impracticable to make any very definite recommendations concerning maintenance, for the railroads as a whole, because of the various influences met with in different parts of the country and during different seasons of the year, such as extreme weather in the northern part of the United States, the needs of agriculture for labor during the harvest seasons in the west generally, and the seasonal needs for labor in the south and southeast, but the records which have been kept by the sub-committee in Washington clearly show that regardless of the difficulties confronting the railroads, some of which have been alluded to, there has been a gradual and constant improvement in the labor situation since the study of the matter was first taken up in 1924.

Particular reference has been made to the fluctuating forces in connection with the maintenance work of the railroads, and as a matter of fact the problem is very largely confined to that branch of the railroad service. It is realized, of course, that the number of employees in the train service will automatically adjust itself to the needs of commerce. Freight trains will not be operated unless there is traffic to be moved, but the maintenance program can be carried on if the financial condition of the companies is such as to justify so doing, regardless of moderate or even considerable variations in the business handled and the revenue earned.

It is the opinion of your committee that there are at least three controlling factors in connection with railroad employment; namely, and in the order of their importance, the lack of stability in railway income, the lack of stability in traffic, and the climatic conditions. It is believed that stability in traffic has been promoted to a very considerable degree by the more dependable character of the service which the railroads have been able to render for the last two or three years. With greater stability of traffic there has come at the same time a greater stability in earnings and more satisfactory net returns, the railroads being able to handle a uniform flow of business with greater economy than would be the case if the same aggregate amount of business during a twelve month period fluctuated greatly in volume from month to month.

With the foregoing in mind, your committee is convinced that in order to bring about and maintain as great a degree of stabilization in labor as may be practicable, it is most important that there should be a sufficiently liberal margin between operating revenues and operating expenses, so that the carriers may be able:

a. To initiate broader policies particularly with reference to their maintenance program, and adopt plans for spreading or distributing such work throughout the year regardless of current monthly revenues.

b. To eliminate so far as possible temporary or emergency expenditures.

It is clear that the most influential, single factor relating to the stability of labor is the question of net earnings by the carriers. The railway managers as a whole have shown a real desire to bring about the greatest possible stabilization of employment, but however their sympathies may run, their action will necessarily be goverened to a very considerable degree by the financial condition of their company.

It is not now suggested that the present rate of return,

as fixed by the commission, is inadequate or would be insufficient if earned, to permit such well-considered practices as might be necessary in order to continue the policies of stabilization thus far inaugurated. It is simply pointed out as a fact of fundamental importance that without a sufficient basis of net income, the railroads will not be able to maintain a stabilized condition of employment, however much they may desire to do so.

Information which has come to your committee during its study of the problem, suggests the desirability of a more flexible day than exists in many places at the present time, as an element to be considered in the stabilization of labor. While there seems to be a general tendency at the present time to recognize the eight-hour day in most lines of employment, there is much to be said in favor of a certain elasticity in the number of hours to be worked. If the day could be increased from eight to nine and even ten hours in times of business activity, and be reduced to eight hours in times when business is less active, such a policy would enable the carriers to employ a more uniform force throughout the year and avoid the necessity of laying off or furloughing large numbers of men in times of business recession.

While a great mass of information has been secured and tabulated in this connection, it is thought that the graphic chart accompanying this report—which shows the fluctuation month by month in the number of man-hours employed by the railroads during the last five and a half years, the gross earnings and rate of return—contains the essential factors of the problem and indicates in a very definite manner what has so far been accomplished towards stabilization.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended June 11, amounted to 1,028,305 cars, a decrease of 24,166 cars, as compared with the corresponding week of last year but an increase of 38,432 cars as compared with 1925. The Pocahontas, Southern and Northwestern districts reported increases as compared with the corresponding week of last year, while the other districts reported decreases, but as compared with 1925 all districts except the Central Western and Southwestern reported increases. Grain and grain products and miscellaneous freight showed increases as compared with last year, but all other commodity classifications showed reductions. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

WEEK ENDED SATURDAY, JUNE 11, 1927

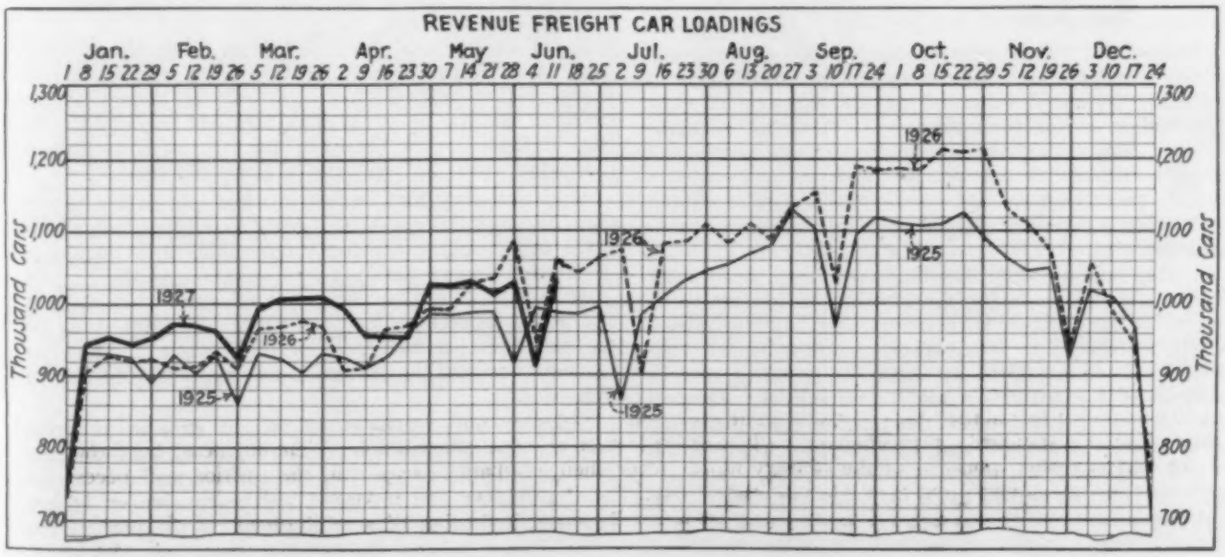
Districts	1927	1926	1925
Eastern	237,243	246,429	236,146
Allegheny	209,613	216,363	201,403
Pocahontas	61,888	58,668	51,737
Southern	148,547	147,918	140,768
Northwestern	165,367	165,334	150,800
Central Western	134,974	143,262	135,218
Southwestern	70,673	74,497	73,801
Total Western districts	371,014	383,093	359,819
Total all roads	1,028,305	1,052,471	989,873
Commodities			
Grain and grain products	40,806	39,400	35,697
Live stock	26,805	28,116	26,041
Coal	158,989	177,207	159,298
Coke	10,683	11,502	9,207
Forest products	69,890	76,663	73,469
Ore	66,516	68,739	61,281
Mdse. L.C.L.	258,389	260,433	257,052
Miscellaneous	396,227	390,411	367,828
June 11	1,028,305	1,052,471	989,873
June 4	911,298	944,864	998,243
May 28	1,026,397	1,080,786	913,087
May 21	1,016,803	1,039,070	987,306
May 14	1,029,126	1,029,748	985,879
Cumulative total, 24 weeks	23,292,169	22,917,146	22,350,734

The freight car surplus for the period ended June 8, averaged 256,448 cars, an increase of 17,614 cars as compared with the preceding week. This included 141,118 box cars and 88,198 coal cars.

Car Loading in Canada

Revenue car loadings at stations in Canada in the week ended June 11 totaled 62,771 cars, an increase of 672 cars over the previous week and an increase of 447 cars over the same week last year.

Commodities	Total for Canada			Cumulative totals to date	
	June 11, 1927	June 4, 1927	June 12, 1926	1927	1926
Grain and grain products	4,833	5,171	7,059	172,586	162,381
Live stock	1,854	1,778	1,891	45,408	46,181
Coal	6,795	7,308	6,254	144,309	107,014
Coke	268	161	231	7,557	9,590
Lumber	4,531	4,535	4,032	80,750	79,395
Pulpwood	2,341	2,220	2,319	93,629	72,035
Pulp and paper	2,507	2,277	2,416	51,569	58,701
Other forest products	3,295	3,221	3,014	74,142	77,591
Ore	1,879	1,583	1,993	33,907	35,359
Merchandise, l. c. l.	17,926	17,651	17,074	385,046	361,402
Miscellaneous	16,542	16,194	16,041	300,972	291,189
Total cars loaded	62,771	62,099	62,324	1,389,875	1,300,838
Total cars received from connections	37,133	34,581	37,179	893,974	859,739



Freight Claim Rules Changed at Annual Meeting

A total of 100,000 additional cars would be available if equipment were loaded more heavily

OVER 100,000 additional cars would be available for the movement of freight during the year if a universal effort were made to load the present equipment of the railroads more heavily, according to C. W. Crawford, chairman of the general committee of the Transportation Division of the American Railway Association, speaking before the 36th annual session of the Freight Claim Division at Quebec, June 14-17. The afternoon of the first day and the morning of the second day of the meeting, which was attended by 250 representatives of the railroads, were devoted to freight claim prevention while the third and fourth days were occupied by the discussion of rules. Officers elected were: Chairman, T. C. Smith, freight claim agent of the Central of New Jersey; first vice-president, H. T. Lively, general claim agent of the Louisville & Nashville, and second vice-chairman, J. D. Shields, freight claim agent of the Chicago, Burlington & Quincy. Detroit, Mich., was chosen as the place of meeting for next year.

Responsibility for Damage Fixed

Changes and rearrangements were made in the present rules under which the responsibility for damage to perishable freight is charged to the carriers at fault when claims are paid for damage to this class of commodity. The rule governing improper ventilation was changed so that the carrier must now prove by proper evidence that it did not fail to adjust the ventilators and hatch plugs between divisional terminals at the temperatures specified.

Another rule changed was that governing the heating of cars. It now calls for the lighting of heaters when the outside temperature is between 0 deg. to 5 deg. above for citrus fruit, 5 to 10 above for apples, pears, cranberries and onions, 15 to 25 above for potatoes, and 15 to 20 above for other perishable commodities. Heaters must be extinguished when the outside temperature is rising and is between 5 and 10 above for citrus fruit, 10 and 15 for apples, pears, cranberries and onions, 15 to 25 for potatoes and 15 to 20 for other perishable commodities.

Report of Committee on Claim Prevention

Loss and damage claims paid in 1926 amounted to $38,187,315 as compared with $38,772,097 in 1925, a decrease of $584,782. Payments on carload freight amounted to $27,503,678 in 1926 and $28,395,708 in 1925, while less than carload totaled $10,683,637 in 1926 as compared with $10,376,380 in 1925. Claims presented and claims under investigation show a slight increase, while the amount of claims in suspense continues to decrease, as follows:

	1926	1925
Number of claims presented	2,491,856	2,380,823
Number of claims under investigation at end of year	221,463	204,962
Amount in suspense at end of year	$3,018,689	$3,185,666

The claim account as a whole has shown a steady decrease during the last six years. Ten of the 16 causes show decreases for 1926 and 6 show increases. The latter include rough handling, unlocated damage, loss of entire package, concealed damage, improper handling, loading, etc., and fire.

Based on evidence developed from hundreds of tests made with impact recording devices it can be safely assumed that fully 95 per cent of the known rough handling occurs in yards and terminal switching; on lines making a close study of the matter, it is known just what yards or terminals are the offenders.

Statistics show that fresh fruits and vegetables, sewer pipe, livestock, automobiles, furniture, eggs, glass, glassware and crockery are the commodities most seriously involved. Supervision and specialization of the highest order are therefore necessary. Each carrier must treat this as an individual line problem and make a study of the conditions in each yard or terminal, with the view of determining the causes and applying corrective measures.

Shippers and receivers of freight can be of great help in the program for controlling carload damage items. Fully 75 per cent of the carload traffic is loaded by the shipper and unloaded by the consignee. There is every indication of a willingness on the part of the

shipping public to take an active part in the educational program, if a plan can be devised for getting to the shippers information about cars improperly loaded. If shippers whose carload consignments frequently are damaged could be made acquainted with the methods employed by shippers whose loading is generally satisfactory, much improvement might be effected.

Chicago Territory to Study Shipments

There is being developed in the Chicago territory a plan for the assembling of reports issued by destination lines on carload consignments originating in the Chicago shipping district. These reports are to be assembled in a neutral bureau, analyzed, and the results of the conditions found will be presented to the respective shippers through that bureau. This work will serve a double purpose: First, it will bring the shipper and railroad man together in an effort to serve the customer to best advantage; second, it will encourage the railroad men engaged in the work.

Receivers at destination points can be of valuable service in correcting causes for damages to carload traffic by (a) promptly notifying the carrier's representative of such damage; (b) giving notice directly to the shipper in cases where it is clearly apparent that the cause of damage is attributable to improper containers, loading or stowing; and (c) keeping a record of the out-turn so that comparisons may be made between various loading methods.

Three main features—containers, standard loading, and transit handling—are involved in the question of carload damages. The Container Bureau is working on the first, the Transportation Division is giving special study to the second, and the operating departments are active in efforts to promote safe handling in transit.

For the first time in seven years the less-than-carload portion of the account shows an increase. This is reflected in 22 of the 32 commodity items, furniture and machinery being the only two increases of substantial amount. Concealed damage represents 6.3 per cent of the total loss and damage account. During 1926 it was approximately $200,000 greater than in 1921. Two commodities (new furniture, l.c.l., and glass and glassware, l.c.l.) account for 39 per cent of all that is paid on this cause. The upward trend keeps step proportionately with the unlocated damage and rough handling items. Defective and unfit equipment shows a decrease of $521,895 or 14.6 per cent as compared with 1925. It has moved downward steadily for a period of more than four years, and for the month of December, 1926, stood 73 per cent under January, 1921.

Delay has shown a decided downward trend, standing today about one-third of the amount registered six years ago. The charges to this account can be further reduced by adopting special plans on individual roads to direct the attention of each class of employees in station, yard and terminal service to the fact that 90 per cent of the money placed in the delay column applies to traffic moving in refrigerator cars and livestock cars, this traffic being of such a nature as to carry its own signal for prompt handling. In 1926 delay represented 8.9 per cent of the total loss and damage bill.

Loss of entire package increased $152,253 during 1926, while robbery of entire packages decreased $99,471, resulting in a net increase of these two items of $52,782. With some fluctuations, the trend of these two items has been downward since January, 1921, reaching 87 per cent decrease. The full meaning of this showing can be realized when one considers the volume of package business in this country. Almost 600,000,000 packages are estimated to be moved per month, or over 7,000,000,000 packages a year. Lost packages are the least excusable of any of the items going to make up the loss and damage bill and the following should be stressed: (1) A strict compliance with the marking rules carried in the Consolidated Freight Classification; (2) a careful checking of the freight at the time of receipt, transfer and delivery; (3) the securing of proof of ownership before the delivery of over or astray freight; the matching of overs and shorts at local and common points; the cross referencing of revenue with astray waybills at destination stations; and (4) affirmative loading and unloading records on the part of carriers, shippers and receivers of freight.

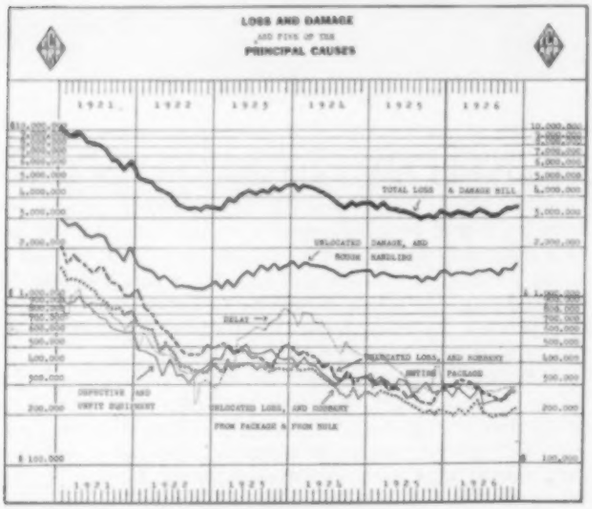
Since 1921 new furniture claims have risen from eleventh to third place in the claim account, and exceed the damage on any other manufactured commodity. The total for 1926 was $1,992,578, an increase of six per cent over 1925. Approximately 95 per cent of all these claims are for damage, $561,765 being classified as concealed damage. Much of the damage actually is faulty packing or loading by the shipper or happens after the delivery to consignee. Non-compliance with the classification, which requires the protection of finished surfaces by sheathing, is a factor.

Damage to L. C. L. Freight to Be Analyzed

C. W. Crawford, chairman of the general committee of the Transportation division of the American Railway Association, said that 100,000 additional cars would be available during the year if a universal effort were made to load cars more heavily. He urged that special efforts be made to ascertain the causes of damage to freight and apply the remedies which will effectively stop transportation wastes or claim payments. This attention should be directed particularly to the loss and

damage to carload freight, the payments on which amounted to 72 per cent of the total claims paid in 1926. A total of $13,108,730, or nearly 50 per cent of the claims paid on carload freight, was allocated to unlocated damage and rough handling, while 65 per cent of this applied to seven commodities.

With this situation in mind, he said, the Committee on Freight Handling Service of the Transportation division has appointed a Special Carload Sub-committee to develop a plan by which damage to carload freight can be analyzed and the necessary remedies applied to insure



a better handling by the carriers and improved loading and packing by the shippers. The sub-committee is authorized to experiment with any plans it may deem advisable with the view of ultimately recommending a plan that could be introduced throughout the country. The Freight Handling Committee has also adopted a resolution requesting the Freight Container Bureau to observe and study the effects of different loading methods.

O. S. & D. Important in Prevention Work

F. B. Hunt, chief of the loss and damage prevention department of the Atchison, Topeka & Santa Fe, spoke on "The Value of the O. S. & D. in Prevention Work." He said the main value of overs and shorts is to match one against the other, get the freight to destination and fortify the records so as to prevent the payment of a claim. The principal advantage to be derived from damage reports, aside from the investigation of individual cases to avoid a recurrence and correct mishandling, is in an analytical way. The present reports do not always serve as good a purpose as possible, due primarily to the fact that too often one blank is designed to cover all commodities and as a result information is not forthcoming that will permit an exhaustive analysis. One form of blank will serve very well for the general run of l.c.l. damages in following up railroad mishandling, but on carload damages which exact the heaviest toll it is advisable to put into use special blanks designed to secure the detailed information necessary for a thorough study of the problem. Uniform blanks designed and used by all carriers for reporting exceptions to certain through carload traffic absorbing the heaviest payments, such as perishables, would undoubtedly be of much benefit.

From an analytical standpoint more satisfaction can be secured by analyzing claims than O. S. & D.'s. A copy of the claim voucher correctly filled in serves very well for this purpose in lieu of the claim itself. These slips can be analyzed according to shippers, consignees, or commodities, and will produce many high spots both as to claimants and commodities and have the added emphasis of showing the actual losses in dollars and cents.

Division forces cannot be kept interested because there is so little tangible data to indicate to them the cost of the mishandlings on their particular territory. At the time the payments are made definite responsibility to a certain employee or division superintendent's territory is seldom if ever placed. In fact, there is little that is tangible or definite about the report and as a result it merely hangs over the head of the operating man like a dark cloud. More interest would be manifested and greater results accomplished if the operating official could be shown that his territory actually produced the mishandling or irregularity that brought about the payment. Prevention bureaus can, through the investigation of O. S. & D.'s, place individual responsibility for mishandling in a large number of cases. This is especially true with over and short reports and more particularly with check clerks' reports covering marked-overs. An increase or a decrease in the claim account is not a true barometer of the performance, for the size of the claim account depends largely upon the volume of traffic. The average value of the dead-overs matched last year was $27. Statistics show that 78 per cent of our short reports are ultimately O.K.'d. This figure applied to the total number of short reports that were O.K.'d gives a total value in round numbers of $225,000 worth of freight which the bureau was instrumental in tracing to destination.

L. V. Method Cuts Loss of Entire Package

E. S. Hartman, supervisor of claim prevention of the Lehigh Valley, discussed the loss of entire package, saying that that road requires that over and short reports be sent to the claim prevention bureau within 48 hours after being checked at the station. Upon receipt in the claim prevention office a different colored card is made for each over and each short, and these cards act as an index to all such cases. When freight checking over or short is closed out the agent is required to make an adjustment report which is sent to the clerks in charge of the matching. The cards covering the item adjusted are removed from the case and placed in a permanent file. The cards in the permanent file referred to are kept a specified time and then destroyed.

Agents are required to communicate immediately with the billing agent when a shipment checks over in an endeavor to locate the revenue billing to cover. Their activities in any such case cease at the end of 15 days, and they forward their entire file to the claim prevention bureau.

Drayman Causes Concealed Damage

Edward Dahill, chief engineer of the freight container bureau of the American Railway Association, discussed concealed damage to glassware, china and new furniture, saying that the many causes of concealed damage may be grouped under one general heading, carelessness. The damage to glassware, china and crockery may be due to the shipper, the carrier, the consignee and the drayman. The latter may weigh only 150 lb. and when he tries to handle a cask weighing from 700 lb. to 1,200, the results may be disastrous.

If a consignee finds breakage, he should stop unpacking, call in an inspector and together they should

carefully find out all the facts and then, deciding upon the probable cause of the breakage, go after the ones at fault whether it is the consignee's own people, the carrier, the draymen or the shipper. He should give the breakage in such container instead of just the lump breakage for the whole shipment.

In shipping furniture, he explained, the crate is intended to protect the article and it should be able to stand up and alone resist distortion. If it does not it must be the furniture that holds the crate up when packed. Marring and scratching of finished surfaces can often be attributed to the handling and not infrequently to the loading, especially in l.c.l. shipments. It may be that the spaces between the strips are too wide, but nevertheless care in trucking the furniture and so loading the crates that pipes, bars and other freight cannot work into them will do much to eliminate the cause of this class of damage.

Freight Claim Work Needs Publicity

William E. Hall, publicity representative of the Association of Railway Executives, addressed the meeting on freight claim publicity. He said the railroads of the United States pursue a policy of perfect frankness with the public in order to develop a better common understanding of the transportation problems. They have endeavored to lay before the public the accomplishments of the rail carriers, their trials and tribulations. They have also endeavored to bring to public attention the fact that the railroads are being efficiently and economically managed. There has been a public demand for this information. The newspapers have used it because of its news value. The public has read it because of an increasing interest in all matters pertaining to the carriers and the growing realization on the part of the

Recommended Method for Loading Apple Barrels

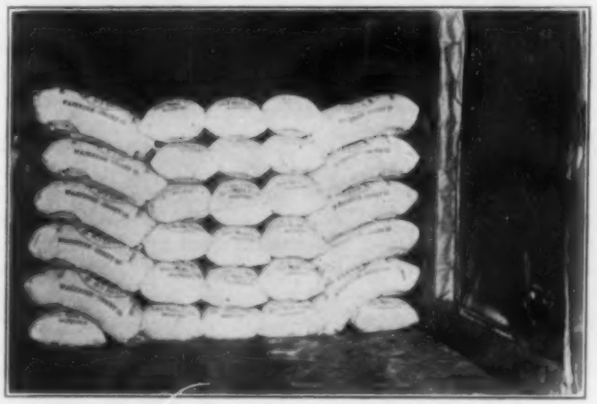
public of the importance of transportation to the prosperity of the country.

The men of the Freight Claim Division have a better opportunity to bring about a constantly increasing kindlier feeling between the shipping public and the railroads than almost any other class of men connected with the great transportation systems of the United States and Canada. Because of that fact, the story of its organization, its work and its accomplishments, should be repeatedly told. To attain success in this work, public co-operation is imperative but to get public co-operation one must acquaint the public with what he is striving to accomplish.

There is a greater need on the part of the division for more intensive public relations work at this time than ever before. From now on still greater effort will be required and for that reason there must be a more intensive co-operation between the railroads and the public.

Diversion Causes Claims

B. A. Podlech, of the loss and damage department of the Atchison, Topeka & Santa Fe, spoke on damage to perishable freight. He said that usually the more times a car is diverted en route, the heavier the breakage is at



"Key-sack" System for Loading Flour

the final destination. Actual tests show that a shipper who has a regular market for his cars and who files no diversions, seldom has any breakage, whereas shippers filing diversions usually have some breakage on each car diverted. This indicates that parties inspecting cars en route are not complying with tariff requirements. In all cases where inspections are made on team or hold tracks no cars should be allowed to be opened or inspected without proper authority. Where boxes are opened and samples removed, they should be marked by the railroad representatives with marking crayon. Many cars of grapes are handled and unloaded by consignees on team tracks. It is believed that the bulk of the breakage is occurring on cars unloaded at wharves or auction houses where the work is usually performed by contract labor.

New York Central Inspection Service Effective

C. L. Jellinghaus, superintendent of property protection of the New York Central, said that the basis for any intelligent and effective prevention work is an adequate inspection service at loading and unloading points. Realizing the necessity for better inspection service and some definite means of reporting, summarizing and analyzing the information so reported, the New York Central adopted a carload exception form a year and a half ago and undertook to index these reports by originating station as well as by commodities. The original or working copy of the report is sent by the issuing agent to his superintendent, who in turn sends it to the loading superintendent or the foreign carrier concerned. The superintendent receiving the form makes a brief record of it to indicate the number received against a particular shipper at a given point. It is then sent to the loading agent for such handling with his forces, car inspection forces or the shipper as may be necessary. All of the larger divisions have a secretary of their divisional loss and damage prevention committees, and these men handle the reports, correspond with the agent or make personal calls upon the

shipper. In addition to this, copies are sent to the property protection department for analysis and supervision of the prevention work and to the freight claim department for claim settlement purposes.

In the larger cities on the New York Central prior to last year carload inspections were made by the agent's forces, regular inspectors and clerks being used where the work was of sufficient volume. Coincident with the adoption of the carload form, this work in most of the larger cities was transferred to the district freight claim agents. The results have been most satisfactory. The inspectors are fully trained, the turnover is small and the inspection reports from these territories are far more complete, both from the prevention and the claim settlement standpoint.

Express Claims Increase

J. H. Butler, general manager of the department of public relations of the American Railway Express Company, said express claim payments showed an increase of 7.67 per cent in 1926 as compared with 1925, the chief cause being the unusual congestion in Florida in the latter part of 1925 and the spring of 1926. As a result, the claims committee of this company has set a goal of a 25 per cent reduction for 1927. A detailed analysis of the claims for the commodities causing the most trouble is being made and special action is being taken to correct the trouble locally or generally. In 1926, 45 per cent of the claims were for damage, 39 per cent for loss and the remainder for delay and miscellaneous causes.

Particular attention is given rough or improper handling, misrouting and delays. In asking the co-operation of shippers the need of tight packing to prevent the shifting of the contents in containers, good containers and legible and complete marking is stressed.

Specialization Will Cut Claims

A. L. Green, special representative of the Freight Claim Division of the American Railway Association, advocated specialization for a further reduction of claims. He said if the railroads could have several hundred experts, similar to those of the inspection and container bureaus, at their disposal no shipper or railroad agent would lack information regarding packing and loading methods.

Mr. Green also urged that the carriers collectively make investigations or surveys to determine the actual causes of damage. Damage to certain articles is so spread out among the carriers that it does not seem to call for much attention, but if claim data were brought together considerable savings in the aggregate might result. If 20 roads would assign a competent man to take a course in training in the causes of damage to furniture, approved packing, crating and stowing practices, and then make a 30 or 60-day observation in his city, more facts and fewer opinions would be secured. Such a survey might be made with the co-operation of the inspection bureaus and under the immediate direction of a small committee of representatives of the several committees and bureaus interested.

O. Maxey, superintendent of freight loss and damage prevention of the Chicago, Rock Island & Pacific, discussed rough handling, saying that it must be identified and isolated and positive factors secured to determine the cause. In addition, a scrutiny of the conditions surrounding carloads in transit must be undertaken by individual lines. An abstract of his address will appear in a later issue of the *Railway Age*.

Joe Marshall, special representative of the Freight Claim Division, recommended that the purchasing departments of the railroads take an active part in claim prevention as they ship and receive more freight than any department and more than a great many shippers. Purchasing departments are in a position to point out to the claim departments cases of improper packing and loading and make sugestgions for their correction. In addition, this department can exert an influence over the shipper by specifying the type of packing and loading desired for railroad supplies.

Supply Officer Takes Stand Against Arbitrary Purchasing

THE notion prevailing among some people that it is the common practice for the purchasing department of a railroad to cut the quantities ordered by users is erroneous, according to J. L. Bennett, purchasing agent, Central of Georgia, in an address before the Southern and Southwestern Railway Club at Atlanta, Ga., on May 19. In a great many cases, said Mr. Bennett, requisitions are rather stereotyped in that certain quantities are ordered regularly by a storekeeper on a basis of past consumption as determined from his records and in these cases the supply department, having originated the order, is quite naturally in the position to exercise judgment but the quantities called for in these requisitions and, particularly, requisitions calling for quantities ordered by users should not be cut unless a careful investigation of the situation has been made.

The question of surplus stock continues to be one of the supply department's largest problems in the opinion of Mr. Bennett. Materials and supplies are necessary for the operation of a railroad. At the same time those in authority question from time to time the large investment in material waiting use and pressure is brought to bear upon the purchases and stores department to hold the purchases to a minimum consistent with safe operation. On the other hand, those responsible for the upkeep of roadbed, cars and locomotives want stocks available at all times to take care of emergency. If for some reason an unusual delay occurs, all conclude that it is well to play safe and they proceed to protect themselves by ordering quantities in excess of requirements for some time to come. This surplus stock represents idle capital which earns no dividends and much of it, with the changing of standards and conditions, finally ends in the scrap pile, and the company loses the difference between its cost and the scrap value. By the use of stock books, the storekeeper can usually keep a close check on ordinary stock items, but where special material is needed he must depend largely upon the using departments when ordering, and unless there is close co-operation between the storekeeper and user of material mistakes are bound to result.

During his address the speaker laid emphasis on the importance of an official supply service and of the department's getting as much notice as possible to provide material for work programs. Car forces may be working on a particular class of equipment and the stock is built up accordingly. If a change is made certain materials lie idle and efforts are directed to rush other materials to meet the changed conditions, but it may be that such materials are hard to accumulate promptly; consequently, delays are experienced, orders are doubled and, by the time deliveries are completed, a surplus of materials results and must be carried for some time to come. A prompt check should always be made before engines are

shopped to determine the material needed. While shop forces can be reduced over night, it takes about 60 days to reduce stock, and while forces can be reinstated over night, stock cannot be built up under 45 to 60 days.

More Simplification Needed

There are too many items carried in stock, according to the speaker. Many sizes and items now carried are a matter of common practice and could be reduced considerably. On the Central of Georgia over 200 sizes and items of material were recently eliminated from stock books. A committee was appointed representing the stores and mechanical departments and this committee will continue working along these lines.

More can be accomplished in standardization. There must always be development in the art of transportation and this, of course, means new appliances, etc., but where standards can be made they should be adopted. Standardization is a great help in stock maintenance, particularly where parts can be made interchangeable on appliances for cars and engines. Invariably, when new power and cars are purchased different standards are adopted with the result that stock must be built up at least along protective lines to meet this demand, thereby increasing the investment. When steel cars are built, it would be preferable if standard sized shapes and channels could be utilized as far as practicable, thus permitting their purchase to advantage particularly as to delivery.

Mr. Bennett also contended that specifications can be made mutually beneficial to all departments. They should cover the principal items in use, but should be elastic enough to permit the purchasing department to go into a competitive market without being restricted to one or two makes. There are items that cannot be handled in this way, but generally it can be done. Competition is the proper basis of purchasing and this feature should be carefully considered.

It is a mistaken idea that the supply department's problem in getting material is simply a matter of getting a price and placing the order. There are times when sources of supply are anxious to serve. But there are times when conditions make it extremely difficult to secure dependable deliveries, times when contract buying is advisable, also when hand-to-mouth buying is the better method. Requisitions should be made clearly and carefully by all departments to eliminate correspondence between the buyer and shipper that tends to delay shipment.

The purchasing and stores department, the speaker concluded, is held responsible for the purchasing and investment of material and supplies and must of necessity exercise its authority by carefully scrutinizing all requisitions and passing for purchase only such as are necessary to be ordered. Being a department of service, however, it should aim to please by conferring frankly and co-operating with all to meet and cover their wants when needed. Unless this is done, the department fails in its mission.

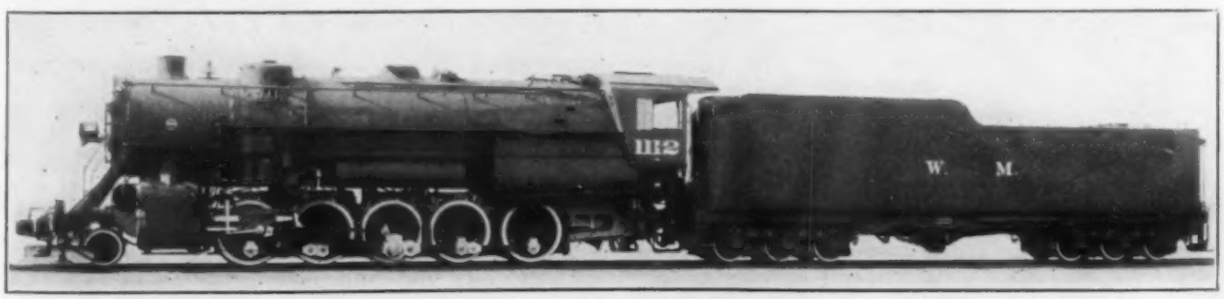
Decapod Locomotives for the Western Maryland

Tractive force of 90,000 *lb.—Tender has capacity for* 22,000 *gal. of water and* 30 *tons of coal*

IN 1921, the Western Maryland placed in service 40 Consolidation (2-8-0) type locomotives, which were built by The Baldwin Locomotive Works. The tractive force developed was 68,200 lb. Ten more 2-8-0 type locomotives with the same general dimensions, were built in 1923. These locomotives are still considered to be the most powerful of their type in service; but in point of capacity, they have recently been outclassed on the Western Maryland by 20 Decapod (2-10-0), type locomotives, recently built by The Baldwin Locomotive Works. The increase in tractive force in the new design is 32 per cent and the steaming capacity has been increased in similar proportion, as shown in the following table:

Type of locomotive	2-8-0	2-10-0
Cylinders, diameter and stroke	27 in. by 32 in.	30 in. by 32 in.
Drivers, diameter	61 in.	61 in.
Steam pressure	210 lb	225 lb.
Grate area	74.9 sq. ft.	104.5 sq. ft.
Evaporative heating surface	3,498 sq. ft.	4,431 sq. ft.
Superheating surface	945 sq. ft.	1,248 sq. ft.
Weight on drivers	268,200 lb.	386,800 lb.
Weight, total engine	294,900 lb.	419,280 lb.
Tractive force	68,200 lb.	90,000 lb.

The boiler of the Decapod type is particularly notable because of its large firebox. The first course of the barrel is conical, increasing the diameter from 92 in. at



Decapod Type Locomotive Built for the Western Maryland by The Baldwin Locomotive Works

the smokebox to 104 in. at the dome ring. The shell plates are 1 in. and 1-1/16 in. thick. The fire-box has a combustion chamber 46 in. long. The crown and sides, and combustion chamber, are constructed in one piece. No arch is used in this firebox, but a brick wall is built across the rear of the combustion chamber. The inside throat sheet is welded in, and the tubes and flues are welded at the firebox end. Flexible staybolts, 775 in number, are used in the breakage zone, and the front end of the combustion chamber crown is supported on four rows of flexible expansion stays. A Standard stoker is applied with the stoker engine placed on the tender.

Steam distribution is controlled by 14-in. piston valves, which are operated by Walschaert motion. The valves have a steam lap of 1⅛ in., with no exhaust lap or clearance; and are set with a travel of 7 in. and a lead of 3/16 in. The back ends of the main rods, and the side rod connections on the main pins have floating bushings. The crank pins are heat treated. Baldwin special cast iron is used for the piston and valve packing rings, and cylinder and steam chest bushings.

Designed to Operate on 3½ Per Cent Grades

These locomotives are designed to operate on grades of 3½ per cent and curves of 16 deg. Plain tires are used on the main pair of drivers, and the play allowed betwen the rails and flanges is ⅞ in. on the front and back drivers, and ¾ in. on all other wheels under the locomotive and tender. The engine truck is of the constant resistance type.

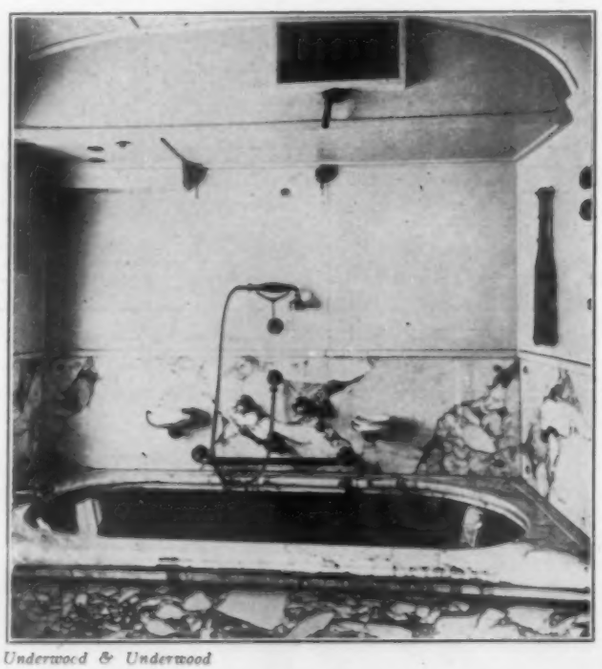
Mention should be made of certain equipment details applied to these locomotives. The sand box is piped to deliver sand ahead of the front and main drivers, and back of the main drivers. Rail washing pipes are also applied. The lubricator is of the mechanical type, with one feed to each valve, one to each cylinder, one to the stoker engine and one to the air pump steam line. A drifting throttle is applied, with a two-inch pipe which is tapped into the right side of the dome. A shut-off valve is placed in the dome, and the line valve has an extension handle to the cab. To provide fresh air in the cab while passing through tunnels, a "breather pipe," connected to the air reservoir line, is placed across the boiler back head. This pipe has five ½-in. globe valves, equally spaced, and each is connected to three feet of hose. The steam turret is placed outside the cab, and the valves most frequently used are fitted with extension handles.

In lieu of a pilot, a specially designed "snow guard," built of steel plate, is placed under the front bumper, with a foot-board on each side.

The tender is one of the largest thus far built, with a capacity for 22,000 gallons of water and 30 tons of coal. The frame is a one-piece Commonwealth steel casting, and the trucks are of the six-wheel Commonwealth type, equipped with clasp brakes. The tender truck axles, as well as the axle of the engine truck, are of heat treated steel. It is interesting to compare the capacity of these tenders with those of the Consolidation type locomotives built in 1921. The latter carried 15,000 gallons of water and 16 tons of coal, and were considered of exceptional capacity at the time of their construction. The new Decapod locomotives have a height overall of 16 ft. 2 in. and a width overall of 11 ft. 2 in. The total length over the faces of the engine front bumper and the tender rear bumper, is 100 ft. 4¾ in.

Table of Dimensions, Weights and Proportions

Railroad	Western Maryland
Builder	The Baldwin Locomotive Works
Type of locomotive	2-10-0
Service	Freight
Cylinders, diameter and stroke	30 in. by 32 in.
Valve gear, type	Walschaert
Valves, piston type, size	14 in.
Maximum travel	7 in.
Outside lap	1⅛ in.
Exhaust clearance	0
Lead in full gear	3/16 in.
Weights in working order:	
On drivers	386,800 lb.
On front truck	32,480 lb.
Total engine	419,280 lb.
Total tender	415,920 lb.
Total engine and tender	835,200 lb.
Wheel bases:	
Driving	22 ft. 6 in.
Total engine	32 ft. 10 in.
Total engine and tender	92 ft. 9½ in.
Wheels, diameter outside tires:	
Driving	61 in.
Front truck	33 in.
Journals, diameter and length:	
Driving, Main	13½ in. by 14 in.
Driving, others	11 in. by 14 in.
Front truck	7 in. by 12 in.
Boiler:	
Type	Wagon top
Steam pressure	225 lb.
Fuel, kind	Soft coal
Diameter, first ring inside	92 in.
Firebox, length and width	131⅜ in. by 114 in.
Combustion chamber length	46 in.
Tubes, number and diameter	64—5½ in.
Flues, number and diameter	252—2¼ in.
Length between tube sheets	17 ft.
Grate area	104.5 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	360 sq. ft.
Tubes and flues	4,071 sq. ft.
Total evaporative	4,431 sq. ft.
Superheating	1,248 sq. ft.
Comb. evaporative and superheating	5,679 sq. ft.
Tender:	
Water capacity	22,000 gal.
Fuel capacity	30 tons
Wheels, diameter	36 in.
Journals, diameter and length	7 in. by 14 in.
Rated tractive force	90,000 lb.
Weight proportions:	
Weight on drivers ÷ total weight engine, per cent	92.4
Weight on drivers ÷ tractive force	4.3
Total weight engine ÷ comb. heat. surface	73.8
Boiler proportions:	
Tractive force ÷ comb. heat. surface	15.85
Tractive force × diam. drivers ÷ comb. heat. surface	967.5
Firebox heat. surface ÷ grate area	3.44
Firebox heat. surface per cent of evap. heat. surface	8.1
Superheat. surface per cent of evap. heat. surface	28.2



Underwood & Underwood

Bathroom in Private Car Recently Built in Germany for the President of Turkey

C. & O. Hearing Concluded

Commission asked to decide on acquisition of Pere Marquette Stock by July 1

WASHINGTON, D. C.

HEARINGS on the application of the Chesapeake & Ohio to the Interstate Commerce Commission for authority to acquire stock control of the Erie and Pere Marquette were brought to a close on June 22 and 90 days were allowed for the parties in the case to file their briefs, after which oral argument is to be heard by the commission. The hearings have been conducted by C. D. Mahaffie, director of the Commission's Bureau of Finance. At the close, Herbert Fitzpatrick, general counsel of the C. & O., read into the record correspondence between Walter L. Ross, president of the New York, Chicago & St. Louis, and W. J. Harahan, president of the C. & O., in which Mr. Ross stated that the Nickel Plate directors had declined to extend beyond July 1 the option for the purchase by the C. & O. of 174,900 shares of Pere Marquette common stock, "in view of the changed conditions," referring to the increase in the market price of the stock as compared with the option price. Mr. Fitzpatrick then made a motion that this phase of the case be at once submitted without argument to the end that the commission may decide before the expiration of the option whether it is in the public interest for the C. & O. to acquire the stock. Counsel for the minority stockholders of the C. & O. objected both to the introduction of the letters and to the motion, saying that if it is to be considered by the commission they desired to be heard on it. Director Mahaffie said he would not strike out the letters but that he did not see how it would be physically possible for the commission to act in the case by July 1.

O. P. Van Sweringen has offered to extend as often as may be necessary the options given on the stock owned by himself and M. J. Van Sweringen, but it was explained that the Nickel Plate could not do so because there is a minority interest of about 48 per cent.

It was then agreed that 45 days should be allowed for the filing of the applicant's brief, 30 days after that for the brief of the protestants, and 15 days additional for the applicants to reply, after which argument is to be heard by the commission as early as advisable.

H. W. Anderson, of counsel for the minority, said that the motion could not be predicated upon the letters unless the facts were proved, and when it was agreed that records of the directors' meetings should be furnished he declined to waive his right to have witnesses to be cross-examined on them. He also said the applicant could not close the case until it had furnished all the information asked of its witnesses, but it was agreed that this should be filed within a few days.

The minority put but one witness on the stand, Howard T. Page, an accountant, who filed a large number of statistical exhibits, taken largely from reports of the roads involved to the commission, with his arrangements of them and computations from them. Minority counsel also asked that the commission's report on the repairs of Erie locomotives in outside shops be made a part of record by reference, in order to explain one of his exhibits. By stipulation the testimony of J. J. Bernet, then president of the Nickel Plate and now president of the Erie, as given in the Nickel Plate hearing in 1925, was also made part of the record.

O. P. Van Sweringen, chairman of the board of the company, was, in effect, instructed by the commission to file for the record a statement of purchases and sales of stocks of the three companies by himself and associates since January 1, 1923. The commission's ruling, rendered after it had heard argument on an appeal by the C. & O. counsel from a ruling by C. D. Mahaffie, director of the Bureau of Finance, overruling their objections, also covered a statement of the monthly cash balances maintained by the Vaness company, the personal holding company of the Van Sweringen brothers, in various banks. After the information had been furnished it seemed rather an anti-climax after the argument on the day before as to whether it should be furnished. It was then expected that after some testimony on behalf of the protesting minority stockholders the hearing would be brought to a close.

The commission's decision applied to four questions asked by H. W. Anderson, of counsel for the minority, when Mr. Van Sweringen was on the stand before, and when Mr. Mahaffie overruled objections the C. & O. counsel filed for oral argument before Division 4.

The full commission devoted an hour and a half to hearing argument as to whether Mr. Van Sweringen should answer the questions on June 20 in advance of its scheduled program for the day.

Herbert Fitzpatrick, general counsel of the C. & O., took the position that as information was already in the record as to the cost to the Van Sweringens of the stock they have optioned to the C. & O., information as to their other transactions in the stocks and in stock of the C. & O., itself was irrelevant. Men appearing before the commission have a right, he said, to rely on their cases being tried according to principles of law and not "run off on side-tracks." He said the commission's interest should be in questions as to whether the proposed control is in the public interest and whether the terms and conditions are reasonable, and he pointed out that the Van Sweringens had not sought to sell their stocks but had agreed to let the company have them at its own price after the commission had indicated, by asking that the connecting line from Gregg, Ohio, to Valley Crossing, be constructed by the C. & O. instead of by the Nickel Plate, that it would not approve a new N. K. P. plan.

H. W. Anderson and Thomas B. Gay, representing the C. & O., minority, took the position that the Van Sweringens had been speculating with the company's assets and that their stock transactions had been impressed with a trust because they had bought stock with the proceeds of loans from banks with which the C. & O. funds had been deposited. They also pointed out that Mr. Van Sweringen had offered to forego profits on the sale of their stock to the C. & O., if the commission thought he ought to and they declared that this made it necessary to find out what the profit was. They said the statement that had been furnished of stock transactions since March, 1925, could not be checked and that the Van Sweringens before that time had made large profits in purchases and sales of Erie stock while manipulating the market for the purpose of creating a price that was not justified.

Commissioner Aitchison remarked that no legal reason had been shown why the Van Sweringens should not make a profit and both he and Commissioner Hall declared themselves not satisfied with Mr. Gay's statement as to the duties of a railroad director. Commissioner

Hall asked if he was not developing a novel theory and asked if Mr. Van Sweringen could have bought stocks to keep himself, or to sell at a loss, or stock of another railroad or a company not a railroad. Mr. Gay's answer was that nothing is better settled than that a trustee cannot trade with trust funds. Commissioner Hall said it was only an assumption that the loans had been made on the credit of the railroad and that it had not been proved. He asked if the Van Sweringens had no credit of their own. Mr. Gay said they had not proved it and had refused to produce their monthly bank balances to show whether they had deposited personal funds in the banks from which they made large loans.

Mr. Anderson said that the C. & O., under Van Sweringen control had deposited its funds in ten off-line banks at 2 per cent instead of in banks along the line at 3 per cent, but Mr. Fitzpatrick asserted that the deposits had not been withdrawn from on-line banks. After he had referred to the Van Sweringen loans having been made on good collateral, Mr. Anderson declared that some of the stocks were in the names of nominees that are in the employ of J. P. Morgan & Co., and that "as a matter of fact Morgan & Co., are both buying and holding this stock." He said that $129,000,000 of railroad assets had been transferred to holding companies to take them out of the jurisdiction of the commission and then used as the basis of loans with which to operate in the market. If that can be done without limit, he said, he would rather have such a privilege "than a license to steal." He referred to the cases of the Rock Island, Alton, Frisco, New Haven, St. Paul, and others, saying they had been "wrecked and that the commission had investigated after it was too late and that "never has there been such a riot of speculation with corporate funds as in this case." Commissioner Hall remarked that that "did not seem to have a very important bearing on the question whether the C. & O., should be allowed to acquire control of the Erie and Pere Marquette."

Chairman Esch announced the ruling of the commission at the opening of the session on June 21, saying that after considering the argument for an hour and a half it had decided to sustain Director Mahaffie's ruling. Mr. Van Sweringen was on hand and said he had had the information prepared in the form of statements certified to by Ernst & Ernst. These showed that from January 1, 1923, to March 31, 1925, the Vaness Company had purchased 77,100 shares of Erie first preferred at a cost of $2,249,315 and had sold them at $3,549,063; that it had purchased 400 shares of second preferred at a total cost of $8,410 and had sold them at various times for a total of $16,524, and 19,900 shares of common bought for $328,660 had been sold for $549,731. Purchases and sales of these stocks subsequent to March 31, 1925, had been placed in the record previously.

It was also shown that the Vaness company had bought 1,800 shares of Pere Marquette preferred in July, 1924, and had sold them in October and November of the same year for $129,345 and that it had bought 210,020 shares of C. & O., common for $28,593,099 which had been sold at various times for $29,469,297. It was explained that this did not include the 255,000 shares of C. & O. stock held throughout the period until its recent transfer to the Chesapeake Corporation.

The statement of bank balances showed monthly balances maintained by the Vaness Company with J. P. Morgan & Co., beginning with April, 1926, and ranging from $81,645 to $820,142, and with the Guaranty Trust Company ranging from $581 up to $119,005. The larger deposits were with the Union Trust Company and the Guardian Trust Company, both of Cleveland. The balances with these two banks were less than a million dollars each up to the end of 1926, but ranged between three and five millions each since then. Mr. Anderson said the statements were not completely responsive to his requests but that with some examination of the accountant who prepared them would probably give approximately the information desired.

The record shows, he said that the price of $110 for Pere Marquette common shows a profit of about $1,600,000 on the stock optioned by the Van Sweringens, while the agreed prices for Erie show a profit of about $800,000. With these figures in the record he asked Mr. Van Sweringen if he would still agree to forego this profit if the commission should think it proper. Mr. Van Sweringen said he would be willing, if the commission will approve the application. Mr. Anderson then asked if he would be willing to readjust the price for the Nickel Plate's holdings of Pere Marquette, on which the option expires July which the Nickel Plate directors have declined to extend, so that half of the profit should be credited to the C. & O. The present market price is considerably above the option price and Mr. Anderson said the Van Sweringens own about half of the N. K. P.

"I realize this is the day of minorities," said Mr. Van Sweringen," but the majority has some rights. I am a stockholder in the Nickel Plate and I am entitled to protection the same as the minority and to the same price that the minority gets."

Mr. Van Sweringen was also questioned briefly by Director Mahaffie before he was excused as to why the C. & O. proposes to finance its purchases of Erie and Pere Marquette stocks by issuing its own common stock at par, when its market price is so much higher. Mr. Van Sweringen replied that the directors had considered the matter of issuing the stock at a premium but had finally concluded that the stockholders were legitimately entitled to it at par.

A detailed "inside story" of the development of the present C. & O. plan from the old Nickel Plate plan, was told on June 16 by Otto Miller, of Hayden, Miller & Co., a director of the C. & O., and a member of the special committee appointed on May 4 to consider a new policy for the C. & O. Whereas Mr. Anderson in his cross-examination of C. & O. directors at the Nickel Plate hearing and later in the C. & O. hearing had endeavored to make them admit that O. P. Van Sweringen had practically dictated their actions and that they had acted largely as "rubber stamps," and although some of them had given some color to such a theory by failure to remember details of what was done at the various meetings or facts and figures on which their decisions were based, Mr. Miller was able to show that the consideration given to the various plans and arguments was by no means perfunctory.

Mr. Miller had kept careful notes and dictated memoranda from them for his personal files shortly after each meeting, showing what was said and done, and had kept copies of the various reports and statistical information that had been studied by the committee. He proceeded to read from these over repeated objections from Mr. Anderson, describing eight meetings at which efforts were made to meet the objections of the commission in a new plan for putting the Nickel Plate, C. & O., Hocking Valley, Erie and Pere Marquette together by unification or some other means, and another series of meetings after this plan was abandoned after the committee had held a conference with Commissioner Meyer.

Most of the rulings made by Director Mahaffie in the hearing have been to overrule objections by C. & O. counsel to questions asked by Mr. Anderson, but this time he overruled Mr. Anderson's objections, saying that while much of the material in Mr. Miller's memoranda was incompetent, the parts quoting other persons

were so intermingled with admissible evidence that he would allow them to be read.

At the first meeting of the committee, Mr. Miller said, it was decided that the commission would not approve the plan unless the voting trust agreement controlling the Vaness Company, which held most of the stocks owned by the Van Sweringen brothers, were abrogated. O. P. Van Sweringen said that he and his brother were willing although he insisted that they had never had any intention of selling the stock while retaining control, even if the stock could be sold under such conditions. It was also decided to give the preferred stock voting rights, to meet the views expressed by the commission, although no member of the committee felt that this should be done and they felt that the commission had been influenced by Prof. W. Z. Ripley's articles on the subject. It was agreed that dissenting shareholders should be given the most ample rights so they would receive full value for their stock, and a plan was discussed for the operation of short lines which the commission might allocate to the system. There was also discussion of the Erie anthracite properties, and Mr. Van Sweringen was quoted as saying that it was the intention that they should be segregated in the event of a consolidation, when it could be legally effected.

In an effort to agree upon stock ratios the committee had the studies made for the majority and minority in the Nickel Plate hearing brought up to date and these were considered in the various meetings and various ratios were discussed in connection with arguments as to the weight to be attached to earnings, values, equities, etc. It developed that no agreement could be reached that would satisfy the C. & O. minority which could be accepted by the Erie and Pere Marquette. Mr. Van Sweringen stated that, as he was interested in all three companies, from his standpoint any change in the ratios would make very little difference, and his only interest was to have the properties properly consolidated upon a fair basis. Estimates were considered that considerable savings could be effected by more efficient operation of the Erie. George Cole Scott and John Stuart Bryan, who had been on the committee representing the minority in the Nickel Plate case, while being opposed to any combination of the C. & O. and Nickel Plate, were represented as being much more favorably inclined toward acquisition of Erie and Pere Marquette. Mr. Scott was quoted as saying that he "had but one suit of fighting clothes and that had been worn out" and that he was now in favor of consolidation of some kind.

Mr. Miller said he had made a point of the likelihood of the C. & O. net income being subject to recapture unless the excess were averaged out by being combined with that of other roads in a system and that President Harahan had stated that the recapture might affect all net above $27,000,000 a year on the basis of a valuation of $450,000,000 as of 1925. Director Mahaffie smiled at this statement and said it was apparent that Mr. Miller's memoranda had not been edited by counsel. He asked if any consideration had been given to the values claimed by the C. & O. in its valuation case, which he said were much higher. Mr. Miller said that he had simply taken a figure that had been used in the Nickel Plate case as the basis for an argument and that there had been no discussion of the exact figure. He had also suggested that if the C. & C. should acquire the Virginian it might "dilute" the earnings for a while and that the Virginian might be taken over by the new company rather than by the C. & O.

In connection with a discussion of depreciation Mr. Harahan had said something about the commission proposing a change in the method of accounting and Mr. Miller quoted himself as saying that that was because the commission "was trying to increase the amount of the C. & O. earnings subject to recapture."

Mr. Van Sweringen had brought to one of the meetings a chart of the earnings of the various roads since 1914, showing that when the C. & O. earnings were high those of the Erie were low, and vice versa, and this had been pointed out as making for stability of earnings in the event of a consolidation.

At a meeting of the committee held in Washington on June 10, 1926, it was stated that an agreement had been reached on everything but the amount of new company stock to be exchanged for C. & O. Mr. Van Sweringen had made an appointment for the committee with Commissioner Meyer and stated that he proposed to show the commission the memoranda of agreements already arrived at. There was a discussion of the points to be discussed with the commission, including the question of voting rights for the preferred stock, the treatment of short lines and the Erie anthracite properties, the amount of stock to go to the C. & O. and other constituents, and other points which the commission had "swept into the basket" in its decision.

The account of the conference at the commission was omitted, but Mr. Miller said that after the committee returned to the hotel "the general impression was not very favorable," that the commission had seemed "indifferent" as to whether the new plan should be filed, and that it was felt that Director Mahaffie seemed opposed to certain features of the plan.

At a meeting on June 25 the committee decided to make a report to the board that it could not agree on ratios and on July 2, the board had authorized the filing of a plan including the Nickel Plate.

New Plan Suggested by Otto Miller

On September 25 Mr Miller had a conference with F. H. Ginn and Herbert Fitzpatrick at which he said he had reached the conclusion that the plan on which they had been working would never go through, that it would result in a "field day for dissenters," and suggested that the C. & O. be made the backbone of the plan. Mr. Ginn and Mr. Fitzpatrick, he said, felt that the time had gone by when this could be effected by exchange of stock, so it was suggested that the C. & O. might buy stock of the Erie and Pere Marquette. Mr. Miller had pointed out that the C. & O. had about $13,000,000 of available cash, which could be used to organize an investment company as the basis of a loan, and that the C. & O. could then issue additional common stock, borrowing on short-term notes meanwhile, in order to pay for the stock.

It was then decided to talk the plan over with Mr. Van Sweringen without mention of prices and this was done at New York on September 28. He agreed to do whatever the committee decided was best for the C. & O. Mr. Miller said, and agreed to give an option on his Erie stock, but wanted the company to buy other stock before taking his. The meeting of the committee was held on September 29 and "all present felt that the plan was feasible." It was decided that a beginning should be made by buying Erie stock in the market and that a fair price for the Van Sweringen stock would be the market prices of September 24, the day before the plan was suggested. When Mr. Van Sweringen was asked what he wanted he replied, according to Mr. Miller, "at any price and on any terms you gentlemen desire," and when told what the committee had suggested he said he was perfectly satisfied. Mr. Bryan then said he felt that no C. & O. director should make a profit on his shares above the option prices and Mr. Miller and Mr. Dart agreed to sell theirs to the company at the same prices. The plan was reported and approved.

"Every one seemed very much pleased," Mr. Miller said, "especially Mr. Bryan and Mr. Scott. Mr. Scott said he would take off his coat and fight for this plan." Mr. Miller then described subsequent meetings relating to the purchases of Erie stock in the market and the negotiations with the Nickel Plate which led to an option on its 169,100 shares of Pere Marquette common at $110 plus some additional at cost.

In an effort to reach an agreement with the C. & O. minority and present a united front before the commission a meeting was arranged for January 21 with the minority committee at which the plan was explained by Mr. Harahan. It was stated that Mr. Anderson had taken the position that the ownership of Erie and Pere Marquette stock by the Van Sweringens had imposed upon them a trust which necessitated turning over those shares to the C. & O. at cost plus carrying expenses and he wanted to know the cost to the Van Sweringens. Other members of the minority committee expressed themselves in favor of the acquisition of Erie and Pere Marquette stock but wanted the Van Sweringen stock at cost. Mr. Anderson also was quoted as saying that it seemed strange that the Nickel Plate was not included. Mr. Van Sweringen said that it seemed to him that the question of the price of the Van Sweringen shares was a matter for consideration if all other terms could be agreed upon.

At the conclusion of Mr. Miller's recital Mr. Anderson moved that all portions purporting to quote other persons be stricken out. Mr. Fitzpatrick said that the testimony was not offered for probative effect as to the facts in the statements quoted and Director Mahaffie said that with that stipulation as to the purpose for which it was offered he would deny the motion.

Mr. Miller Cross-examined

Mr. Miller's cross-examination by Mr. Anderson was brief. Asked "who was protecting the interest of the C. & O. stockholders at the meetings," Mr. Miller said he did not think he or Mr. Van Sweringen could be accused of attempting to depress the value of their C. & O. stock, even if Mr. Scott and Mr. Bryan had not been present, but that the value of the C. & O. was recognized and what they had to do was to show the value of the Erie. When Mr. Anderson pointed out that he had been the one to speak of the danger of recapture, Mr. Miller said: "I wanted to save that recapture money for myself and for you. The government has enough money. My idea was that the government wanted the railroads put together in systems so that the large earnings of one might offset the weakness of another."

Mr. Anderson then asked the witness if, as a banker, he would consider it sound finance to sell C. & O. stock paying 10 per cent dividends and earning 25 per cent at par to buy Pere Marquette stock earning only 14 per cent. Mr. Miller replied that he would do it if he owned the entire C. & O. himself, both in the interest of the corporation and to give the stockholders a valuable right. He said the C. & O. capital stock is out of balance in relation to its bonds. It now has about $118,000,000 of stock and the proposed increase to about $180,000,000 would give a broader stock base for the bonds. In reply to a question as to whether it would not be better to put out 5 per cent preferred stock he said the time to put out common stock is when it is good and then future financing can be done with preferred stock and bonds, at a time when the common stock may not be so high as at present.

When Mr. Anderson asked what plans the directors have for financing the purchase of the additional shares of Erie and Pere Marquette necessary to obtain complete control, Mr. Miller said that if the commission approves the plan they will buy when the price is right or wait. The shares do not have to be in hand by any particular time, he said, and the C. & O. could probably exercise a considerable degree of control over the Erie or Pere Marquette as the largest stockholder without owning an actual majority, especially if it were understood that it expected to acquire more.

Three additional directors of the C. & O. testified and were cross-examined on June 17 as to what had influenced them to vote for the plan, after which it was announced that the C. & O. had completed its presentation of testimony. John C. Myers, of Ashland, O., said he was not a railroad man and had in mind only in a general way figures as to the earnings of the roads and their condition. He had been guided largely, he said, by confidence in the special committee that had made a thorough study of the questions involved. J. H. Dart, of Richmond, Va., who said he owned 35,000 shares of C. & O., stated he had been influenced by the report of the special committee but that he had also made a close personal study of the affairs of the roads involved ever since the original Nickel Plate merger was proposed. He read a statement which he said he had prepared himself of the reasons why he felt the plan was a good one both for the railroads and for the general public. He pointed out that it avoids the complications involved in trying to work out ratios of stock exchange and that under it each road retains its individual advantages while deriving additional advantages from the others through combination. For years, he said, he had thought that railroad mergers would be a good thing and that through routes ought to be under a single management to avoid so many occasions for having agreements between separate managements.

He thought the Erie and C. & O. would balance well because the Erie tracks are used only to half their capacity westbound while the C. & O. has more westbound traffic than it can handle and he expressed the opinion that Erie stock would be worth more than its present market price and more than its asset value because of its prospects for improved earning power.

On cross-examination Mr. Dart said he had sold 8,000 shares of C. & O. but that after selling his 14,800 shares of Erie stock to the company at the option prices and after the company had stopped buying Erie he had bought some more and paid about $8 a share more than he had sold for. He said he had made very little on the stock he had sold to the company. Mr. Anderson asked him to file a complete statement of his purchases and sales of stock of the three roads and he agreed to have one prepared to be filed if the commission thought it advisable.

Alva Bradley, of Cleveland, Ohio, said he had become a director at the request of Mr. Van Sweringen and owned only 100 shares of C. & O. He said he had voted for the plan after hearing an explanation of it by President Harahan and that the point that had made the greatest impression on his mind was the opportunity to use the Erie line from Marion, Ohio, to Chicago for westbound traffic. Also, being in the coal business, he had seen West Virginia coal largely supplant Ohio and Pennsylvania coal in the markets of Ohio and Michigan but had felt that the Pennsylvania and Ohio fields would get the business back, as they are gradually getting on to a non-union basis, and he had felt that the C. & O. would need the help of the Erie and Pere Marquette in maintaining its coal traffic in competition with eastern roads. He admitted frankly that he had voted for the prices fixed in the options for the stock because he had followed the recommendations of the committee, but he added that he thought they were fair and that they were approximately the market prices at the time.

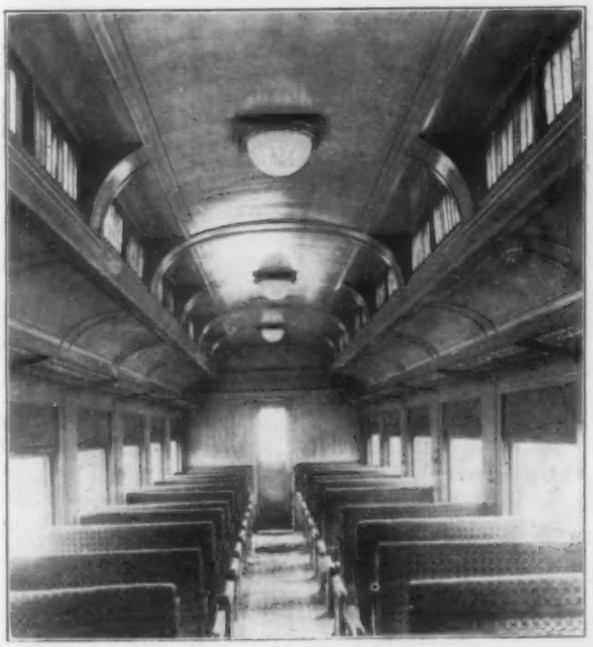
Frisco Passenger Car Just Out of the Shop after Being Finished with Duco

The Frisco's Experience with Lacquer

Use of Duco for two and one-half years shows its economy on locomotives and passenger cars

By H. L. Worman
Superintendent Motive Power, St. Louis-San Francisco, Springfield, Mo.

SINCE November, 1924, the St. Louis-San Francisco has applied the lacquer finish known as Duco to 274 passenger cars of both steel and wood construction, to 626 locomotives in all classes of service and, within the past six months, to 30 passenger car interiors.



Interior of Frisco Coach Finished with Lacquer and Received at the Shop for Minor Repairs After a Year's Service—The Interior Finish Required Cleaning Only

Frisco Tender with Lacquer Finish Just Out of the Tank Shop

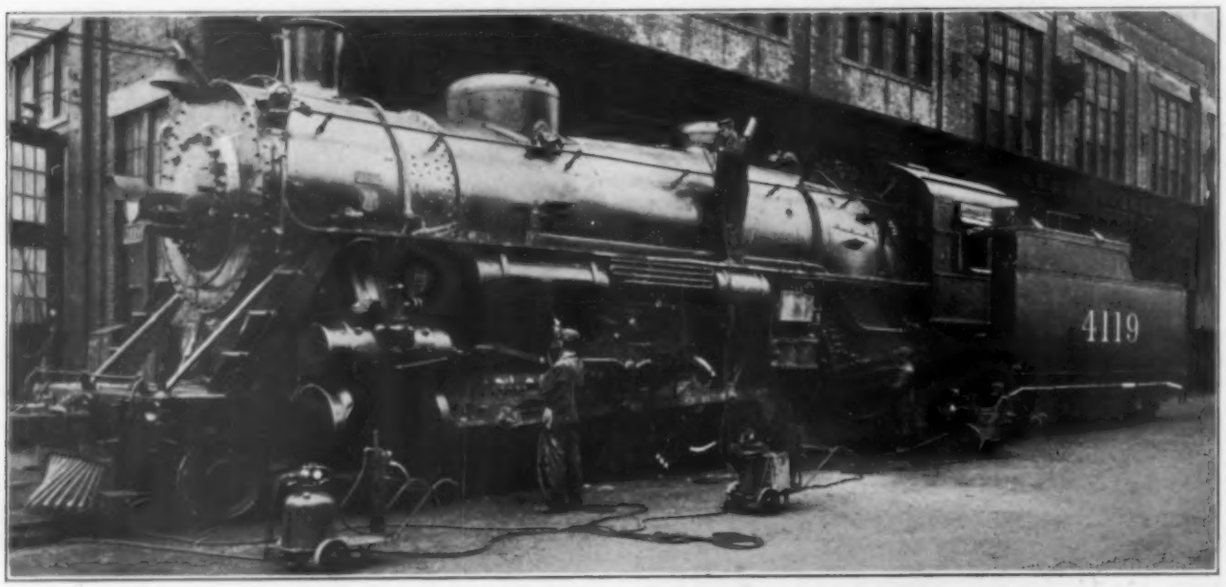
The results on steel equipment have been satisfactory, demonstrating marked advantages over former finishes in speed of application, durability under adverse climatic conditions, attractive appearance which improves after repeated cleaning, and other operating advantages. While wooden cars have always presented a more difficult problem of painting than steel cars, from the standpoint of the durability of the finish, and some early experiences with lacquer on wooden cars of the St. Louis-San Francisco were unsatisfactory, a flexible lacquer, designed especially for wooden interiors and exteriors, has now been in service for about a year with good results.

The quick-drying feature of lacquer, together with its rapid application usually by means of a spray gun, greatly reduces the time which equipment must spend in the paint shop, and experience on the Frisco has shown that this time, as compared with that necessary with the common varnish system, is approximately 50 per cent less. The saving in time is offset to a certain extent

by greater material cost, but this leaves a large net economy due to greater durability of the lacquer finish, easier cleaning and other factors. While varnished Frisco cars formerly had to be refinished on an average of every 18 months, 274 of these cars, sprayed with Duco, in most cases over the old undercoats, have now been in service up to 30 months with no attention except cleaning and they show no indication that refinishing will be necessary until after a still further extended period of service.

Locomotives finished with varnish are in service an average of 12 to 18 months before the finish needs renewal, but the average service life with Duco finish on a locomotive is increased to 18 to 24 months and the labor cost of application is 30 per cent less. It is easier to clean cars or locomotives finished in lacquer due to the hardness and toughness of the film, but an accurate estimate of the actual saving would be difficult to make.

A brief description of the lacquer used on Frisco equipment may be of interest. Manufactured by E. I. du Pont de Nemours Company, Inc., Parlin, N. J., it consists in general of nitrocotton with a small percentage of other ingredients dissolved in special solvents, and a finely ground pigment to provide the color. It is in effect a finishing material used in place of color and varnish coats. When applied to a surface the solvents quickly evaporate, leaving a film which is tough and hard. While a paint or varnish film dries by oxidation, lacquer dries by evaporation and as soon as this action ceases a chemically inert and stable thin film of material has been deposited on the surface which does not check or braise and which wears subsequently by slow erosion only.



Application of Duco to Frisco Locomotive at the West Springfield, Mo., Shops

Paint Shop Operations Speeded Up

One of the most important advantages secured by the use of lacquer on Frisco equipment is greater speed of application. Undercoats are applied in practically the same time by both systems, but the greater speed of the application of lacquer is such that the total time is only seven days for the complete refinishing of a passenger coach exterior from the surface out, as compared with 14 days or more with the previous finish. This enables the same amount of work to be done in the paint shop with only 50 to 70 per cent of the previous force. An example of how the work can be speeded up in an emergency was afforded recently when urgent need for two passenger cars in the Frisco paint shop at Springfield, Mo., unexpectedly developed because of a wreck on the road. These cars were primed and surfaced ready for application of the finish coats, were sprayed with two coats of Duco, lettered and delivered to the transportation department in eight hours.

The increased speed of application has materially reduced the demand for paint shop space. Another advantage, due to the rapid drying feature of lacquer, is that finishing work may be safely done on cars in the paint shop with only reasonable precautions against the circulation of dust in the air. Another feature of great importance is that variations in temperature and humidity cause practically no difference in the rate of setting of a lacquer film, while under certain atmospheric conditions paint shop work was greatly retarded due to slow setting of the former finish.

A large percentage of Frisco cars are refinished by the application of Duco over old undercoats. In such cases, the time required for refinishing is three to four days as compared with six or seven days by the former system. Patching of mechanically injured cars is made comparatively easy owing primarily to the fact that there is no oxidization or chemical change in lacquer, once hardened, and when a second coat is applied it unites with the first to make a single coat.

The interiors of 30 passenger cars are finished largely by spraying with lacquer, which saves the labor of rubbing down with pumice stone, formerly necessary to reduce the gloss of varnish finish. Owing to the time saved in spraying and the elimination of rubbing down the interior, a standard passenger car can be refinished with Duco on the inside in six days as compared with nine days with varnish. A combination of the spray and brush methods of application has given the best results on car interiors, large areas being sprayed and small areas and the junction between colors brushed. Trimmings can be applied to sash, doors and car interiors two hours after the application of the lacquer.

In addition to the equipment mentioned above, four Frisco 100,000-lb. steel hopper cars and one caboose car

have been finished with lacquer. The caboose has been in service a year, the finish showing no signs of deterioration. Lacquer is also used on Frisco car furniture, window curtains, imitation leather, linoleum aisle strips, steel hoppers, etc. Sash and doors are mounted on the racks shown in one of the illustrations, the glass covered around the edges with a protective coating of soap and whiting, and lacquer sprayed on, with a substantial saving in time over former brush methods. A similar method is used in protecting the windows of locomotive cabs while being sprayed. The coating is readily removed from the glass with a knife after the application of the lacquer.

The methods followed by the Frisco in applying undercoats and finish lacquer coats follow specifications suggested by the manufacturer.

Use of Lacquer on Locomotives

On November 29, 1924, the first Frisco locomotive, No. 1294, was sprayed with lacquer and since that date 626 locomotives have been finished with this material.

Cab with a Protective Coating on the Windows Ready for the Application of Lacquer—Curtain Temporarily in Place

Experience has shown that compared with a life of former materials of 12 to 18 months, lacquer gives 18 to 24 months' average service. The cost of application is 30 per cent less and the cost of the material about 30 per cent more, leaving a substantial net saving due to the greater durability of the lacquer finish and more rapid preparation of the locomotive for service. As in the case of cars, this latter feature is due to the fact that lacquer dries quickly and does not interfere with completion of the many small jobs which must be handled promptly in preparing a locomotive for service.

All parts of the locomotive and tender are finished with lacquer except the smoke box, firebox, side sheets and engine and tender trucks. The usual practice as shown in one of the illustrations is to use one painter with a spray gun on the running boards for finishing the upper parts of the locomotive and to have two on the ground to spray cylinder jackets, motion work, etc. Asbestos particles and dirt of all kinds are first blown off by compressed air and the lacquer is sprayed on with the usual spray guns. The tender is ordinarily finished and lettered in the tank shop and the cab in the cab shop, but all of the rest of the locomotive is sprayed during the noon hour. Mechanics can go to work on the locomotive almost immediately afterwards to perform any necessary finishing operations and in this way the painting causes no delay in getting the locomotives ready.

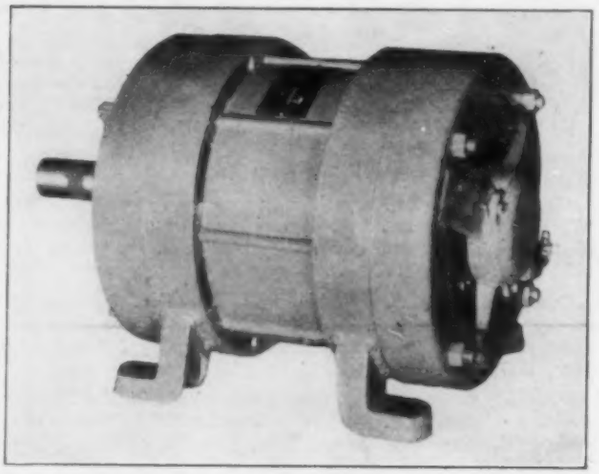
The use of lacquer has produced another marked advantage in connection with the cleaning of car equipment because the surface is hard and smooth and does not hold dirt and foreign material as readily as the varnished surface. As a result, cleaning costs are substantially reduced. Plain soap and water has been found to give best results in cleaning. Especially on interiors is the cleaning advantage noticeable and in this case soap and water or oxalic acid or other cleaning materials on varnished interiors produce a streaked effect and ruin the finish. Lacquer is not harmed and, in fact, improves in appearance.

In the period of 2½ years in which lacquer has been used, extensively on the St. Louis-San Francisco there have been no indications of harmful results in health hazard, or fire risks.

All-Steel, Ball-Bearing, Induction Motors

A LINE of all-steel, ball-bearing polyphase induction motors, ranging in size from 1 to 100 hp. in all standard voltages and frequencies is announced by the Lincoln Electric Company, Cleveland, O. This type of motor is representative of the modern designs of equipment in which gray iron and malleable castings have been entirely replaced by hot rolled steel.

It is claimed that every part of the motor is at least twice as strong as the former type which was built with a cast iron frame. Drop forged steel feet are welded on



A Lincoln, All-Steel Ball-Bearing, Induction Motor

to the hot rolled steel end rings of the motor. This, it is claimed, eliminates a common source of difficulty with electric motors arising from the fact that cast iron feet are frequently broken off in rough handling. The end brackets or bearing supports are also made up of welded steel construction giving a complete all steel motor.

Economies in manufacturing by the new process have permitted the use of much larger shafts and bearings than is usually found on this type of equipment.

Owing to the greater strength of steel as compared with cast iron, less thickness of metal is required in the frame. The increased ventilation so obtained results in a considerable increase in the overload capacity of the motor, so that a continuous overload of from 10 to 50 per cent can be handled by the motors depending upon the size and speed.

New Books

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

British Railway Operation, by T. Bernard Hare. "... so far as I know, Mr. Hare's is the first book [on railway operation] published in this country which comes from the hand of a practicing railwayman." In Foreword by Sir Ralph Wedgwood, Chief General Manager of the London & North Eastern on which Mr. Hare is Assistant District Supt. at Hull. 156 p. Pub. by Modern Transport Publishing Co., Ltd., 3 shillings sixpence.

New England Railroads, by Harold H. Young. Reviews present status of New England railroads, and includes a folding map. 31 p. Pub. by Bodell & Co., Providence, R. I.

Reference List of Literature on Urban Electric Railways Indexed by Cities...With Classified Index, June, 1927, compiled by Library, Boston Elevated Railway. References to material on 90 cities in this country and abroad covering such points as arbitration awards, franchises, valuation, rate cases, reorganizations, ownership, reports of experts and service standards. 158 p. Published by Library, Boston Elevated Railway, Boston, Mass.

Stabilization of Employment on the Railroads. Report of Committee on Stabilization of Employment to Executive Committee, Association of Railway Executives. 9 p. Pub. by Association of Railway Executives, Washington, D. C.

Freight Commodity Statistics, Class I Railways in the United States, Year Ended December 31,1926, by Bureau of Statistics, U. S. Interstate Commerce Commission. Statement No. 21,100 (third in the series). 139 p. Pub. by Govt. Print. Off., 50 cents.

Periodical Articles

Do Your Stuff and Keep Your Eyes Open, by Neil M. Clark. "This is how Lawrence A. Downs climbed to the presidency of the Illinois Central Railroad." American Magazine, July 1927, p. 36-37, 163-167.

Group Insurance Experience of Various Establishments. A survey of practices and results including the experience of 2 steam railroads and 6 electric railroads. Monthly Labor Review, June, 1927, p. 76-86.

Railroading—Then and Now—An Interview with F. D. Underwood, by Edward Hungerford. Considerable railroad history since 1870. Saturday Evening Post, June 18, 1927, p. 31, 181-182, 185-190.

Arabia and the Inter-Oceanic Canals. Editorial discussion of the effects of Panama and Suez on international commerce and railroad construction, as well as on the economic history of the countries bordering them. Commercial and Financial Chronicle, June 11, 1927, p. 3408-3409.

Labor and Scientific Management, by Prof. Irving Fisher. "Labor unions are already started on the new road towards increasing production in order to increase wages as, for instance, on the Baltimore & Ohio Railroad and the Canadian National Railways." p. 697. American Federationist, June, 1927. p. 694-699.

Moffatt Tunnel Will Alter Trade Routes, by Laurence Beech. Effect on transcontinental traffic. Boston Transcript, June 1, 1927, part 2, p. 10.

The Battle of Phantom Cities, by Elmer T. Peterson. How city promoters tried to help along history with railroads as weapons in Kansas not so very long ago. Saturday Evening Post, June 4, 1927, p. 45-47, 213-217.

Looking Backward

Fifty Years Ago

Revised regulations of the Chicago & Alton contain these terms: Brakemen will receive for the first six months of actual employment $40 per month, and thereafter $45; conductors will receive for the first year $55 per month, for the second $65; and thereafter $75.—*Railway Age*, June 28, 1877.

A bushel of corn is now carried from Chicago to Buffalo by lake for 1½ cents, and from Buffalo to New York by canal and river for 4½ cents; making the total for over 1,400 miles of navigation, 5¾ cents. The railroads do not attempt to compete with these ridiculous figures, maintaining a rate of 30 cents per 1,000 lb., from Chicago to New York.—*Railway Age*, June 28, 1877.

Twenty-Five Years Ago

At a meeting of the directors of the Illinois Central on June 18 it was decided to increase the capital stock from $79,200,000 to $95,040,000. This represents an increase in the amount of stock of 20 per cent and is in line with the policy of this company of selling stock to provide funds for capital expenditures.—*Railroad Gazette*, June 27, 1902.

Bion J. Arnold, who was commissioned in August, 1901, by the New York Central to study the feasibility of operating the trains of this company between Grand Central Station, New York, and Mott Haven Junction, 5.3 miles, by electricity presented the results of his investigation to the annual meeting of the American Institute of Electrical Engineers, on June 19, recommending the adoption of a direct current system. He advised the use of the third rail for main line and overhead construction for service in the yards.—*Railway Age*, June 27, 1902.

The city council of Chicago on June 23 passed an ordinance which requires the Chicago & North Western, the Chicago, Burlington & Quincy and the Chicago Terminal Transfer to each elevate three miles of double track between Western avenue and Canal street. A mandatory ordinance has already been passed compelling the Chicago Junction and the Pittsburgh, Cincinnati, Chicago & St. Louis to elevate for two miles from Twelfth to Thirty-ninth streets. The former measure will involve elevation of 11 miles of double track, construction of 30 highway subways and abolition of 36 grade crossings at an estimated total cost of $3,500,000.—*Railway Age*, June 27, 1902.

Ten Years Ago

Plans for the employment of women in positions which usually are filled by men on the larger railroads are apparently keeping pace with the resignations of men who are leaving their positions through the demands of the war. Women are being employed on the Baltimore & Ohio and the Erie in shop and other kindred out-door work.—*Railway Age Gazette*, June 22, 1917.

The great effort of the railroads in this national crisis is to furnish transportation in the largest measure with the facilities at their disposal, declared Fairfax Harrison, chairman of the Railroads' War Board, in an interview explaining the objective of the American railroads. The transportation machine cannot be suddenly amplified, even with the Government behind it, he said. It may be that some transportation must wait for happier times; many of those who are seeking to continue their commercial mode of living as though a state of war did not exist will have to change these methods.—*Railway Age Gazette*, June 22, 1917.

Odds and Ends of Railroading

There are times when it is wise to believe all you hear, for instance, when a locomotive is whistling for a grade crossing.

"I thought that train stopped at this station?"

"Yes, it is supposed to, but the engine-driver can't bear the station-master."—KASPER, Stockholm.

The epic transportation feat of a non-stop New York-Paris airplane flight is recognized by the Pullman Company by the naming of one of its new cars "Charles Lindbergh."

In an out-of-the-way corner of a graveyard in the Ozarks is a tombstone bearing this inscription: "Here lies Abner Thomas, who departed this life unexpectedly by being hit by a locomotive. Well done, thou good and faithful servant."

Musical chimes in diners continue to be heard from. This time it is Bernard Hoffman, of Santa Barbara, Cal., who reports having heard them recently on the Sunset Limited of the Southern Pacific. The railways seem to be emulating that old verse, which starts: "Ring out wild bells across the snow."

Visiting Fireman: "Beg pardon, but can you tell me if there is an engineer running on this division with one eye named Ephraim Smith?"

Roundhouse Foreman: "Maybe I can help you out. What's the name of his other eye?"

That women have been invading the railway field rapidly has been observed for some years back, but Estella B. Prince, local attorney for the Baltimore & Ohio at Brownstown, Ind., is the only woman serving the B. & O. in that capacity and states that, so far as she knows, she is the only feminine local attorney in the United States.

An alert looking man was gingerly picking his way along the ties of a railroad, seemingly in search of something or someone.

"What are you looking for?" inquired a curious bystander.

"The president of this line," was the answer.

"But you'll not find him here."

"Maybe not, but I'm on his track."—EXCHANGE.

The St. Louis-San Francisco has changed the name of its station—Coal Creek, Ala., to Lindbergh, in honor of Col. Charles A. Lindbergh, whose relatives have been the only residents at that place for a number of years. Augustus Lindbergh, an uncle of the aviator, served until his death in 1909 in charge of a Frisco pumping station at that point. After his death the post was given to a son, Oscar.

At Larrabee, Wis., there still stands a railway station that was built 60 years ago, and to which the railway has never come. Shortly after the Civil War, the Chicago & North Western made surveys in the vicinity of Larrabee and Jason Pellet was so certain that the railway was coming through his farm that he built the station. The building has two waiting rooms, booths for ticket agents and telegraph operators, a large dining room and hotel accommodations upstairs. A cupola 8 feet square with four windows was built on top of the station. But the railway was never built and the ambitious station is still a farmhouse.

The Ministry of Transport of Jugoslavia has decided to use Esperanto, the artificial international language, for notices to passengers in all of its cars in international service. This language which, it is said, can be learned by anyone in a few weeks, seems to be making steady, albeit slow, progress in Europe. Some time ago the International Union of Railwaymen gave its approval to an effort to spread the use of the tongue. In a land where international boundaries are crossed and languages alter with every change of engines on an express train there must be many persons who feel the need of some such vehicle of expression.

Frugality in New England and Points West

Mrs. Gossip—Did she get much silver for wedding presents?

Mrs. Scandal—Yes, she got 99 spoons. Three were marked "sterling," 80 "Pullman" and 16 "B. & M."—B. & M. MAGAZINE.

Which reminds us of an anecdote related by E. F. Flynn, assistant to the vice-president and general counsel of the Great Northern, in an address delivered at the 1925 convention of the Equipment Painting Section, A. R. A. The story, as it appears in the printed proceedings of the meeting, follows:

"The other evening Mrs. Flynn was calling on some friends of ours by the name of Smith. Mrs. Smith said, 'You know, Mrs. Flynn, you just can't trust these servant girls any more.' 'What is the matter now?' Mrs. Flynn asked. She said, 'When the last girl left she actually stole a dozen of our very best towels.' Now, Mrs. Flynn knew Mrs. Smith very well. She said, 'What towels were they?' Mrs. Smith said, 'They were a dozen of those nice towels I got on that last trip to Seattle on the Oriental Limited with "Pullman" written on them.'"

Writes Like a Chicken, but Isn't One

The work of railway association secretaries and members of their staffs is always onerous and only sometimes does it seem to receive the recognition that it merits. However, one of the members of the staff of E. R. Woodson, secretary of the Railway Accounting Officers' Association, received high reward at the annual meeting of that association held in Denver the second week of June, because he was honored by being made a chief of the Pueblo tribe of Indians.

One of the entertainment features of the convention was Chief Evergreen Tree who favored the assembled delegates with Indian melodies and imitations of bird and animal calls. Afterwards the Chief asked the secretary to write a letter of commendation for him which the secretary kindly prepared to do. He dictated it to Earl Pryor, one of his assistants, who took it down in shorthand. So impressed was the Indian chieftain in the peculiar script and the ability of young Pryor to write and read it that he welcomed him as a chief into his tribe with appropriate ceremony. He named him Chief *Spin-a-tiv-wa* (the italics and spelling are ours) which translated into the vernacular of the day means, we are told, "The fair haired boy who writes like a chicken." Whether the "chicken" is to be taken in the slang sense, or whether it really means poultry we are not informed.

When last seen Big Chief Spin-a-tiv-wa was headed from Denver towards the Southwest. It was supposed that he was on his way to the home of his new people.

In the Twilight

I have climbed up here to the top of the hill,
And the world is still, and the world is still
    And the first thin shades of the night drop down
    Over the houses below, in town;
And the light of our home comes up to me
With a welcoming smile, most pleasantly.
And I'm waiting here, as I often do,
For the train that will soon swing into view,
    Bringing my dear one home to me
    I listen and look expectantly
For the rising column of thin, grey smoke
That will spread in the sky like a sable cloak;
    For the mellow whistle that soon will sound
    Far 'round the curve, while the echoes bound.
And he—my dearest, for whom I wait—
He drives that train! It will not be late!
    My strong, young husband! He brings each day
    That long train home, in his fine, sure way.

QUARRIER BICKERS

NEWS *of the* WEEK

Western Pacific—Photo by H. F. O'Neil

WESTERN RAILROADS and representatives of the Brotherhood of Locomotive Firemen and Enginemen will meet at Chicago on July 7 to discuss a proposed increase in wages for firemen and hostlers of from $1 to $1.25 per day. Approximately 50,000 employees on all railroads west of Chicago, including the Illinois Central and Wabash, are involved in the conference.

THE ANNUAL PICNIC of the L. & N. Veterans' Club was held at Louisville, Ky., on June 11. Employees of the Louisville & Nashville, with their families and friends, were in attendance to the number of more than 10,000. The program for the day included a memorial service for members of brotherhoods who died during the past year.

APPRENTICES of the mechanical department of the Atchison, Topeka & Santa Fe have compiled and issued the "Iron Horse," a volume summarizing all apprentice activities for 1926. It calls attention to the fact that 242 supervisory officers in the mechanical department of the Santa Fe, including an assistant to the vice-president, eight division master mechanics and 16 roundhouse foremen, are graduates of the apprentice school.

TWO MEN who have been identified by federal authorities as Roy A. A. and Ray De Autremont were arraigned at Steubenville, Ohio, on June 9, and were taken to Jacksonville, Oregon, to answer charges of murder and robbery of the mails in connection with the holding up of Southern Pacific express No. 13 near Siskiyou, Ore., on October 11, 1923, when three trainmen and a mail clerk were killed. A dynamite blast which set fire to the mail car prevented the bandits from obtaining any loot. Rewards totaling $15,000 were offered by the Southern Pacific, the American Railway Express Company and the government. A third brother, Hugh, who had been captured in Honolulu, was tried and convicted at Jacksonville, on June 21, of murder in the first degree.

THE BROTHERHOOD OF LOCOMOTIVE ENGINEERS, meeting in convention at Cleveland, Ohio, on June 16 voted to dissolve an agreement with the Brotherhood of Firemen and Enginemen, in effect since 1913, under which the two unions acted in accord in their discussion of wages and working conditions with railroad companies. The decision to terminate the agreement was reached following insistence of the B. of L. E., during negotiations with southeastern carriers in February, that firemen's wages be fixed at 55 per cent of the wages paid to engineers, a figure the firemen refused to accept. The dissolution of the agreement will take effect after 30 days, when the Brotherhood of Firemen and Enginemen will have been given formal notification of the action.

Danger in Poison Weed-Killer

The Nebraska State Railway Commission through its counsel, Hugh La Master, has rendered an opinion that railroads that spray poison on the track for the purpose of retarding the growth of weeds are violating a state law of Nebraska and are subject to prosecution. Farmers along a line of the Chicago, Burlington & Quincy filed a complaint in which they reported that livestock had died after grazing along the right of way.

Golden Spike Driven at Pawhuska

In the presence of members of 27 Indian tribes, townspeople and railroad officers, Governor Henry S. Johnston of Oklahoma drove a golden spike at Pawhuska, Okla., on June 16, celebrating the completion of the line of the Atchison, Topeka & Santa Fe from Caney, Kan., southwestward through Pawhuska, to Fairfax, Okla., 64 miles. That portion between Caney and Pawhuska, 37 miles, has been in operation for about two years, and the present celebration marks the opening of the 27 miles southwest of Pawhuska.

N. Y. Railroad Club Outing

The New York Railroad Club will hold its annual summer outing on June 30 at the New York Athletic Club, Travers Island. The golf tournament will be held at the Winged Foot Golf Club, Mamaroneck, N. Y., at 9:30 a.m. (daylight saving time). For the Travers Island entertainment a special train will leave Grand Central station at 12 noon.

A lunch will be served at 1 p.m. and dinner at 7. Events planned for the day include a baseball game (New York Central Publicity Department vs. New York Times), tennis, quoits, a track meet and swimming. Reservations are in charge of D. W. Pye, 30 Church street, New York.

Loving Cup for W. H. Newell

William Henry Newell, of Rocky Mount, N. C., who recently retired as general superintendent of the Atlantic Coast Line, having been placed on the pension list because of reaching the age of 70, was the recipient, on June 21, of a handsome silver loving cup, filled with ten-dollar gold pieces, the gift of his associates on the A. C. L. in Virginia and the Carolinas.

Mr. Newell began as a telegraph operator and had been in the service of the road for more than 50 years. His service as general superintendent of the first division extended over a period of 20 years. Mr. Newell was an unusual man and the letter which, on his retirement, he received from President J. R. Kenly says that his name "will always be an inspiration for the officers and employees of the company."

Further Time Allowed for Train Control Installations

The Interstate Commerce Commission on June 22 announced further extensions of time granted the Lehigh Valley, Central of New Jersey, Reading and New York, New Haven & Hartford for the fulfilment of its automatic train control order of January 14, 1924, the second order, from July 1 to December 31. The commission also granted a petition filed by the Baltimore & Ohio, Central of New Jersey and Reading for the exemption from the provisions of the order of certain locomotives operating in train control territory over the tracks of the B. & O., between 24th and Chestnut streets, Philadelphia, and Eastwicks Junction, Pa., a distance of 2.04 miles.

Too Expensive to Speed Completion of Hudson Bay Line

To speed up completion of the Hudson Bay Railway to Port Nelson so as to have it in operation this year would involve an extra expenditure of nearly $350,000, according to a lengthy message sent by Charles A. Dunning, Minister of Railways and Canals at Ottawa, to J. A. Stoneman, president of the Saskatchewan section of the United Farmers of Canada, which organization is urging completion of the road this year. Mr. Dunning also says it would be impossible to have engine terminal facilities completed this year, the last 44 miles of the line could not be ballasted this year, and even if the track were laid to port by December 31 this year the Canadian National could not guarantee to operate the line to tidewater for the balance of the year.

North Western Re-examines Trainmen

The Chicago & North Western, under the direction of its chief surgeon, Dr. C. W. Hopkins, has completed the general physical examination of more than 10,000 train service employees, obtaining in each case a full medical history which it is intended shall be kept up to date and revised each year. Heretofore annual examinations have been made only of those train service employees who were more than 50 years of age or who found it necessary, through defective vision, to wear glasses.

Of the total number examined at 90 places on the system only 40 were found to be sufficiently defective to require their disqualification from train service and three of that number have since reached the age for retirement under pension. These 40 trainmen represented 0.3 of 1 per cent of the total number in service. Examinations were begun by local company surgeons on January 15 and continued until April 15. Information obtained in these examinations is considered confidential and is known only to the staff of the chief surgeon. Subsequent examinations provide facts upon which the division superintendent or master mechanic may base promotions.

The three forms used on the North Western, the surgeon's report of re-examination, the pocket certificate of re-examination and the record of examination for en-

(*Continued on page 2022*)

Operating Revenues and Operating Expenses of Class I Steam Railways in the United States

Compiled from the Monthly Reports of Revenues and Expenses for 183 Steam Railways, Including 14 Switching and Terminal Companies

FOR THE MONTH OF APRIL, 1927 AND 1926

Item	United States		Eastern District		Pocahontas Region		Southern Region		Western District	
	1927	1926	1927	1926	1927	1926	1927	1926	1927	1926
Average number of miles operated	238,317.42	237,613.19	59,448.94	59,555.95	5,554.71	5,554.39	39,537.22	39,143.56	133,776.55	133,359.29
Revenues:										
Freight	$371,389,511	$370,616,002	$167,624,833	$169,658,771	$20,453,879	$17,881,086	$54,344,494	$54,576,114	$128,966,305	$128,500,031
Passenger	a 77,332,016	b 80,673,084	39,828,423	40,885,529	1,762,872	1,829,953	10,551,166	12,415,258	25,189,555	25,542,344
Mail	7,947,828	8,018,982	3,072,102	3,063,098	212,908	226,494	1,175,685	1,189,793	3,487,133	3,539,597
Express	13,441,893	12,873,123	6,281,960	6,101,578	323,929	274,055	1,981,204	2,028,165	4,854,800	4,469,325
All other transportat'n	17,515,774	17,757,779	9,443,706	9,594,657	275,776	279,580	1,235,856	1,374,973	6,560,436	6,508,569
Incidental	10,137,522	9,852,806	5,163,066	5,107,659	393,704	434,736	1,216,990	1,343,162	3,363,762	2,967,249
Joint facility—Cr.	1,081,201	1,087,416	464,013	442,501	15,341	12,678	138,222	147,483	463,625	484,754
Joint facility—Dr.	417,875	390,001	139,650	135,628	3,098	3,055	39,562	33,779	235,565	217,539
Ry. operat'g revenues	498,427,870	500,489,191	231,738,453	234,718,165	23,435,311	20,935,527	70,604,055	73,041,169	172,650,051	171,794,330
Expenses:										
Maintenance of way and structures	75,832,907	72,013,659	30,125,392	28,574,874	3,240,790	3,100,000	10,297,357	10,641,533	32,169,368	29,697,252
Mainten'ce of equipm't	102,622,245	108,639,919	49,339,219	52,531,427	4,944,015	4,973,737	13,545,709	14,339,580	34,793,302	36,795,175
Traffic	9,942,059	9,367,285	3,646,864	3,361,181	258,925	247,279	1,696,859	1,691,562	4,339,411	4,067,263
Transportation	176,804,023	176,797,509	83,941,643	83,688,158	6,069,981	5,660,583	24,543,342	25,981,240	62,249,057	61,467,528
Miscellaneous operat'ns	4,443,469	4,502,380	2,085,662	2,118,097	91,290	93,719	554,212	594,052	1,712,305	1,696,512
General	16,073,417	15,733,806	7,181,475	7,289,136	550,010	482,241	2,153,343	2,056,416	6,188,589	5,906,013
Transportation for investment—Cr.	1,050,132	1,271,536	171,617	140,079	27,614	29,675	82,277	239,843	768,624	861,939
Ry. operat'g expenses	384,667,988	385,783,022	176,148,638	177,422,794	15,127,397	14,527,884	52,708,545	55,064,540	140,683,408	138,767,804
Net revenue from railway operations	113,759,882	114,706,169	55,589,815	57,295,371	8,307,914	6,407,643	17,895,510	17,976,629	31,966,643	33,026,526
Railway tax accruals	30,390,191	30,388,165	12,527,428	12,874,469	1,778,038	1,527,173	4,268,676	4,307,634	11,816,049	11,678,889
Uncollectible ry. rev's.	158,228	165,472	71,462	82,128	4,415	3,620	25,752	19,672	56,599	60,052
Ry. operat'g income	83,211,463	84,152,532	42,990,925	44,338,774	6,525,464	4,876,850	13,601,082	13,649,323	20,093,995	21,287,585
Equipm't rents—Dr. bal.	7,389,132	6,548,703	4,147,573	4,194,536	d 476,831	d 664,381	1,030,155	1,480,325	2,688,235	1,538,223
Joint facility rent—Dr. balance	2,195,178	1,722,123	1,102,156	662,864	98,080	94,242	92,966	137,983	901,976	827,034
Net railway operating income	73,627,153	75,881,706	37,741,196	39,481,374	6,904,212	5,446,989	12,477,961	12,031,015	16,503,784	18,922,328
Ratio of expenses to revenues (per cent)	77.18	77.08	76.01	75.59	64.55	69.39	74.65	75.39	81.48	80.78

FOR FOUR MONTHS ENDED WITH APRIL, 1927 AND 1926

Average number of miles operated	238,186.96	237,537.69	59,447.29	59,510.30	5,555.31	5,551.98	39,477.45	39,143.57	133,706.91	133,331.84
Revenues:										
Freight	1,489,716,510	1,461,565,877	668,195,635	653,155,103	82,044,208	74,906,598	212,645,640	222,685,345	526,831,027	510,818,831
Passenger	c 314,107,569	e 329,689,338	156,169,421	159,005,902	6,965,797	7,324,760	47,091,354	56,574,433	103,880,997	106,784,243
Mail	31,390,055	31,719,146	11,904,162	11,933,353	833,234	856,450	4,683,255	4,795,124	13,969,404	14,134,219
Express	43,540,881	45,058,068	20,882,727	21,214,246	1,039,074	1,005,021	5,935,519	7,018,579	15,683,561	15,820,222
All other transportat'n	65,335,413	65,014,809	36,237,117	36,386,828	848,466	828,119	3,910,739	4,357,678	24,339,091	23,442,184
Incidental	38,851,157	38,964,041	19,869,903	19,619,727	1,599,734	1,556,311	5,020,954	5,943,769	12,360,566	11,844,234
Joint facility—Cr.	4,486,163	4,262,638	1,854,260	1,731,209	54,668	54,891	579,013	565,490	1,998,222	1,911,048
Joint facility—Dr.	1,681,411	1,531,921	540,009	530,056	9,614	8,976	133,579	135,343	998,209	857,546
Ry. operat'g revenues	1,985,746,337	1,974,741,996	914,573,216	902,516,312	93,375,567	86,523,174	279,732,895	301,805,075	698,064,659	683,897,435
Expenses:										
Maintenance of way and structures	262,946,155	256,687,640	109,440,022	107,299,730	12,437,167	11,688,447	39,317,645	40,826,697	101,751,321	96,872,766
Mainten'ce of equipm't	417,074,415	428,252,809	200,941,908	206,121,484	20,098,784	19,747,206	54,455,970	56,673,579	141,577,753	145,710,540
Traffic	39,234,477	36,476,001	14,353,635	13,248,086	1,018,469	974,728	7,058,093	6,843,837	16,804,280	15,409,350
Transportation	731,968,531	726,610,574	351,067,461	345,013,810	25,039,341	24,337,386	99,619,715	106,587,803	256,242,014	250,671,575
Miscellaneous operat'ns	18,095,400	17,916,668	8,472,261	8,328,212	359,396	383,069	2,447,583	2,642,560	6,816,160	6,562,827
General	63,974,665	61,478,934	29,132,915	28,389,824	2,184,112	1,874,915	8,406,100	7,998,239	24,251,538	23,215,956
Transportation for investment—Cr.	4,040,069	4,218,415	763,935	473,427	92,480	88,863	624,711	891,524	2,558,943	2,764,601
Ry. operat'g expenses	1,529,253,574	1,523,204,211	712,644,267	707,927,719	61,044,789	58,916,888	210,680,395	220,681,191	544,884,123	535,678,413
Net revenue from railway operations	456,492,763	451,537,785	201,928,949	194,588,593	32,330,778	27,606,286	69,052,500	81,123,884	153,180,536	148,219,022
Railway tax accruals	119,481,917	118,534,539	46,959,134	47,085,396	7,136,052	6,101,111	16,634,595	17,486,746	48,752,136	47,861,286
Uncollectible ry. rev's.	508,745	564,055	205,866	290,435	12,504	14,960	79,643	60,131	210,732	198,529
Ry. operat'g income	336,502,101	332,439,191	154,763,949	147,212,762	25,182,222	21,490,215	52,338,262	63,577,007	104,217,668	100,159,207
Equipm't rents—Dr. bal.	28,093,699	25,046,293	15,681,879	13,808,786	d 1,845,669	d 2,573,889	3,653,429	6,897,575	10,604,060	6,913,821
Joint facility rent—Dr. balance	8,444,195	7,542,361	4,218,368	3,075,054	417,993	406,656	361,735	449,804	3,446,099	3,610,847
Net railway operating income	299,964,207	299,850,537	134,863,702	130,328,922	26,609,898	23,657,448	48,323,098	56,229,628	90,167,509	89,634,539
Ratio of expenses to revenues (per cent)	77.01	77.13	77.92	78.44	65.38	68.09	75.31	73.12	78.06	78.33

a Includes $3,179,921 sleeping and parlor car surcharge. b Includes $3,183,944 sleeping and parlor car surcharge. c Includes $12,830,119 sleeping and parlor car surcharge. d Deficit or other reverse items. e Includes $13,120,267 sleeping and parlor car surcharge.

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Operating Statistics of Large Steam Roads—Selected Items for the Month of April, 1927,

Region, road and year	Average miles of road operated	Train-miles	Locomotive-miles: Principal and helper	Locomotive-miles: Light	Car-miles: Loaded (thousands)	Car-miles: Per cent loaded	Ton-miles (thousands): Gross, Excluding locomotive and tender	Ton-miles (thousands): Net, Revenue and non-revenue	Average number of locomotives on line daily: Serviceable	Unserviceable	Per cent unserviceable	Stored
New England Region:												
Boston & Albany	1927	407	207,250	221,139	22,926	5,058	67.1	257,385	92,532	112	13	10.5	8
	1926	407	234,422	250,462	26,677	5,120	66.4	264,547	98,169	128	17	11.8	16
Boston & Maine	1927	2,085	488,796	555,208	50,844	12,580	71.2	634,684	249,207	283	73	20.5	30
	1926	2,250	502,247	581,508	52,654	13,959	70.2	655,366	261,395	337	85	20.2	42
N. Y., New H. & Hartf.	1927	2,140	569,221	603,301	37,636	16,279	68.8	831,383	329,431	306	68	18.2	24
	1926	2,163	559,137	590,732	38,011	15,927	67.8	827,296	336,292	310	59	15.9	20
Great Lakes Region:													
Delaware & Hudson	1927	875	344,336	469,450	53,812	10,787	65.4	653,105	316,680	249	34	12.0	82
	1926	875	388,582	527,173	55,407	10,880	64.3	683,641	332,927	236	38	13.9	52
Del., Lack. & Western	1927	999	592,652	688,188	82,611	19,137	67.5	1,076,826	459,134	272	48	15.0	20
	1926	993	579,502	690,106	91,966	18,232	68.9	1,020,123	450,600	274	54	16.4	11
Erie (inc. Chic. & Erie)	1927	2,317	905,685	1,013,233	102,536	34,885	64.5	2,044,333	863,441	513	138	21.1	100
	1926	2,323	937,128	1,031,491	102,739	34,600	64.9	2,086,205	919,371	570	124	17.8	105
Lehigh Valley	1927	1,346	577,418	633,062	76,526	18,287	64.9	1,065,612	464,702	354	87	19.7	70
	1926	1,345	612,493	673,613	76,815	18,625	63.9	1,091,331	474,799	398	91	18.7	73
Michigan Central	1927	1,820	576,272	592,195	19,411	19,276	61.0	1,076,530	369,629	242	63	20.7	57
	1926	1,835	597,707	615,172	19,757	20,920	62.7	1,105,448	377,464	285	47	14.2	90
New York Central	1927	6,478	1,953,411	2,197,333	138,180	77,588	63.1	4,585,562	1,930,654	1,122	309	21.6	334
	1926	6,482	2,087,057	2,356,983	166,285	76,392	63.6	4,505,690	1,916,737	1,163	322	21.7	265
New York, Chic. & St. L.	1927	1,665	610,227	615,490	5,831	19,884	65.5	1,070,420	401,782	231	60	20.7	51
	1926	1,665	651,488	659,487	6,250	20,417	65.7	1,114,048	434,514	245	59	19.5	54
Pere Marquette	1927	2,180	437,888	443,616	6,474	11,533	62.9	663,157	271,118	187	36	16.1	19
	1926	2,179	446,113	455,588	7,360	11,575	63.6	648,659	258,989	186	31	14.1	19
Pitts. & Lake Erie	1927	231	117,701	119,389	2,305	4,305	62.4	332,291	187,258	56	18	24.5	11
	1926	231	123,959	126,703	1,379	4,048	62.4	296,585	162,088	59	22	26.8	17
Wabash	1927	2,497	718,970	751,566	10,341	21,733	63.9	1,193,868	415,565	324	60	15.7	58
	1926	2,497	730,215	761,536	11,715	21,933	65.2	1,219,751	468,512	301	71	19.0	47
Central Eastern Region:													
Baltimore & Ohio	1927	5,220	1,905,471	2,218,568	191,399	56,290	61.7	3,732,593	1,778,934	1,029	203	16.5	116
	1926	5,197	1,834,791	2,116,735	176,567	53,388	63.0	3,357,427	1,571,508	1,028	182	15.0	173
Central of New Jersey	1927	691	264,805	289,439	33,392	8,089	59.4	531,396	252,391	175	46	20.8	14
	1926	691	272,079	295,193	33,648	7,512	60.8	501,128	244,968	232	38	14.0	55
Chicago & Eastern Ill.	1927	945	244,816	247,727	3,927	6,310	62.5	378,498	164,563	114	57	33.5	35
	1926	945	247,570	247,642	3,812	6,684	61.8	400,470	176,289	124	38	23.6	41
Clev., Cin., Chic. & St. L.	1927	2,374	731,185	771,868	21,337	22,595	60.2	1,455,697	649,283	335	96	22.3	31
	1926	2,374	699,415	732,041	19,233	21,880	61.6	1,399,932	638,103	325	109	25.1	26
Elgin, Joliet & Eastern	1927	461	129,957	137,603	5,607	3,641	62.3	279,782	144,894	80	11	11.6	...
	1926	460	131,423	140,431	6,188	3,974	63.7	296,436	153,232	79	12	13.0	...
Long Island	1927	393	48,743	53,796	15,640	649	54.8	43,914	17,961	50	9	15.7	...
	1926	393	53,515	56,618	15,289	686	54.6	45,379	17,832	47	13	21.8	...
Pennsylvania System	1927	10,843	4,350,724	4,768,400	376,526	134,209	64.1	8,595,229	3,922,091	2,863	442	13.4	661
	1926	10,882	4,629,605	4,999,764	351,663	132,959	63.8	8,534,357	3,901,820	2,655	584	18.0	320
Reading	1927	1,130	643,398	700,074	69,692	17,807	60.8	1,232,631	626,699	322	68	17.5	34
	1926	1,131	641,742	704,145	69,003	17,210	60.9	1,170,449	589,315	366	72	16.3	69
Pocahontas Region:													
Chesapeake & Ohio	1927	2,650	1,152,500	1,241,082	46,907	38,585	56.6	3,088,160	1,660,781	552	89	13.8	57
	1926	2,650	1,068,884	1,132,397	38,379	33,099	56.6	2,615,434	1,407,997	547	97	15.1	73
Norfolk & Western	1927	2,232	842,339	1,032,733	36,269	29,853	60.2	2,426,353	1,305,706	560	48	7.9	142
	1926	2,231	825,685	1,011,486	35,708	27,980	60.4	2,232,100	1,199,758	585	60	9.3	166
Southern Region:													
Atlantic Coast Line	1927	5,034	859,430	870,992	14,139	23,412	59.0	1,320,818	476,640	421	63	13.0	65
	1926	4,924	974,867	994,797	15,532	24,121	57.1	1,430,673	530,631	416	60	12.7	21
Central of Georgia	1927	1,898	307,268	310,470	5,851	7,529	70.6	408,181	177,596	138	25	15.1	11
	1926	1,907	387,690	389,117	5,862	7,897	62.5	476,317	204,457	157	22	12.2	19
I. C (inc. Y. & M. V.)	1927	6,555	1,916,282	1,934,687	45,554	51,308	62.9	3,256,138	1,367,790	794	108	12.0	32
	1926	6,555	1,892,514	1,905,986	39,520	50,969	62.9	3,200,693	1,356,372	752	110	12.7	14
Louisville & Nashville	1927	5,048	1,813,254	1,901,609	58,945	37,762	58.9	2,622,302	1,246,975	607	120	16.5	9
	1926	5,021	1,789,184	1,874,555	65,896	33,906	57.8	2,350,320	1,105,796	600	113	15.9	16
Seaboard Air Line	1927	4,237	638,578	651,028	7,903	15,800	60.1	938,429	349,904	298	51	14.5	7
	1926	3,905	637,374	651,652	21,459	15,491	59.9	922,001	360,044	267	34	11.2	1
Southern Railway System	1927	8,021	2,105,618	2,138,409	42,021	52,647	63.7	2,976,855	1,195,174	1,062	160	13.1	30
	1926	8,043	2,232,376	2,279,741	42,666	51,676	61.6	3,011,057	1,203,110	1,037	148	12.5	22
Northwestern Region:													
Chic. & North Western	1927	8,463	1,241,844	1,277,406	20,387	31,227	66.8	1,705,488	686,715	730	142	16.3	142
	1926	8,457	1,402,478	1,435,231	23,808	34,184	64.4	1,917,221	748,145	751	171	18.5	122
Chic., Milw. & St. P.	1927	11,202	1,437,131	1,517,165	87,374	42,927	66.3	2,357,438	973,635	784	189	19.4	195
	1926	11,190	1,449,651	1,555,956	96,230	42,586	65.7	2,366,891	997,449	871	220	20.2	210
Chic., St. P., Minn. & Om.	1927	1,724	273,852	290,295	11,381	5,839	68.8	306,546	125,735	166	31	15.8	38
	1926	1,819	301,105	320,906	12,602	6,015	65.1	317,516	122,913	166	37	18.1	3
Great Northern	1927	8,164	702,977	725,527	40,282	25,078	68.1	1,417,074	647,777	550	166	23.2	138
	1926	8,222	696,435	723,676	42,877	24,185	69.5	1,324,070	602,382	575	153	21.0	145
M., St. P. & S. Ste. M.	1927	4,368	469,710	483,415	3,937	12,244	66.7	648,448	276,284	288	37	11.4	31
	1926	4,372	515,156	525,908	3,384	12,705	67.8	660,243	280,169	287	53	15.6	24
Northern Pacific	1927	6,496	746,076	788,682	41,685	25,459	71.0	1,377,339	612,473	470	167	26.2	92
	1926	6,510	776,303	814,007	43,231	26,128	70.3	1,409,427	618,509	504	142	21.9	96
Oreg.-Wash. R. R. & Nav.	1927	2,164	179,376	188,662	13,641	5,453	74.2	296,885	134,513	130	22	14.3	13
	1926	2,185	177,451	187,089	14,043	5,534	73.1	302,862	139,107	134	20	12.9	16
Central Western Region:													
Atch., Top. & S. Fe (incl. P. & S. F.)	1927	10,377	1,672,115	1,807,448	96,801	54,014	65.4	3,138,820	1,138,438	756	156	17.1	128
	1926	10,143	1,544,193	1,670,375	90,536	47,054	64.1	2,750,416	980,838	810	145	15.2	235
Chicago & Alton	1927	1,016	262,440	282,196	4,355	5,818	58.0	356,812	130,367	140	18	11.1	36
	1926	1,022	289,416	304,215	4,236	6,703	58.5	421,298	164,197	139	23	14.3	33
Chic., Burl & Quincy	1927	9,334	1,299,157	1,346,143	52,857	37,722	64.2	2,105,413	905,335	716	203	22.1	61
	1926	9,349	1,433,266	1,472,208	52,586	43,060	63.8	2,483,410	1,106,786	806	195	19.5	78
Chic., Rock I. & Pacific	1927	7,562	1,358,200	1,409,305	14,349	32,510	60.7	1,888,562	701,699	553	112	16.8	39
	1926	7,564	1,349,130	1,397,380	14,002	30,947	60.1	1,807,939	668,164	534	159	22.9	45
Denver & R. G. Wn	1927	2,536	193,025	225,556	38,679	5,767	71.0	329,278	156,309	218	49	18.3	37
	1926	2,556	201,512	243,414	45,153	5,664	69.4	321,963	149,909	223	55	19.7	36
Oregon Short Line	1927	2,539	249,221	268,792	26,271	7,562	72.8	427,566	193,921	184	21	10.1	53
	1926	2,537	289,216	302,125	19,404	7,990	68.1	462,262	200,514	192	28	12.7	57
Sou. Pac.—Pac. Lines	1927	8,723	1,470,460	1,595,248	218,340	44,355	62.0	2,747,036	1,026,157	685	254	27.1	70
	1926	8,523	1,375,390	1,505,467	243,122	41,108	63.2	2,512,748	971,630	721	202	21.9	85
Union Pacific	1927	3,714	736,257	757,431	39,193	30,406	76.4	1,544,288	631,972	454	49	9.8	199
	1926	3,691	825,555	850,154	41,197	32,200	73.9	1,687,929	700,593	467	63	11.9	186
Southwestern Region:													
Gulf, Colo. & S. Fe	1927	1,933	363,999	379,293	12,789	10,337	59.2	671,037	285,186	143	26	15.6	6
	1926	1,897	263,324	275,030	5,204	7,504	64.3	445,882	186,935	115	22	16.2	20
Mo.-Kans.-Tex.	1927	1,787	281,258	282,507	7,158	9,670	56.5	585,838	203,928	103	20	16.4	31
	1926	1,787	242,544	243,204	5,701	8,223	58.8	485,534	178,980	111	23	17.0	41
Mo.-Kans.-Tex. of Tex.	1927	1,389	180,804	185,595	3,380	5,094	57.5	317,946	122,541	114	15	11.3	57
	1926	1,389	162,648	165,918	3,072	4,351	61.1	251,604	96,559	127	19	12.9	65
Missouri Pacific	1927	7,317	1,188,499	1,234,207	39,086	33,143	66.5	1,872,746	777,537	524	72	12.1	6
	1926	7,311	1,351,061	1,386,610	42,573	38,208	63.5	2,251,476	941,610	530	85	13.9	1
St. Louis-San Francisco	1927	4,860	776,406	793,819	11,152	18,791	61.6	1,118,424	452,158	386	68	15.0	75
	1926	4,895	800,293	817,465	13,076	18,704	60.2	1,123,624	452,341	427	64	13.1	71
Texas & New Orleans	1927	4,570	789,233	792,359	1,617	16,959	64.1	994,233	401,938	259	61	19.1	32
	1926	4,435	689,960	692,641	3,457	15,021	65.9	844,946	339,853	258	67	20.5	38
Texas & Pacific	1927	1,954	394,150	394,150	1,467	10,513	59.9	650,678	235,659	158	18	10.3	15
	1926	1,953	275,021	275,021	522	7,525	61.8	439,155	161,343	154	25	14.1	16

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Compared with April, 1926, for Roads with Annual Operating Revenues Above $25,000,000

Region, road and year	Average number of freight cars on line daily: Home	Foreign	Total	Per cent unserviceable	Gross ton-miles per train-hour, excluding locomotive and tender	Gross tons per train, excluding locomotive and tender	Net tons per train	Net tons per loaded car	Net ton-miles per car-day	Car miles per car-day	Net ton-miles per mile of road per day	Pounds of coal per 1,000 gross ton-miles including locomotive and tender	Locomotive miles per locomotive day
New England Region:													
Boston & Albany	1927 3,038	5,167	8,205	3.0	16,492	1,242	446	18.3	376	30.6	7,578	179	64.9
	1926 2,309	5,569	7,878	4.1	14,762	1,129	419	19.2	415	32.6	8,042	183	63.9
Boston & Maine	1927 13,515	11,743	25,258	6.4	15,426	1,298	510	19.8	329	23.3	3,984	125	56.7
	1926 12,531	14,923	27,454	7.1	14,271	1,302	519	20.0	317	22.6	3,872	143	50.1
N. Y., New H. & Hartf.	1927 23,100	18,501	41,601	17.4	18,762	1,461	579	20.2	264	19.0	5,132	122	57.2
	1926 19,915	21,807	41,722	15.5	17,715	1,480	601	21.1	269	18.8	5,183	132	56.8
Great Lakes Region:													
Delaware & Hudson	1927 9,974	6,031	16,005	3.8	22,877	1,897	920	29.4	660	34.3	12,062	150	61.6
	1926 8,474	7,008	15,482	5.1	20,898	1,759	857	30.6	717	36.5	12,680	163	70.7
Del., Lack. & Western	1927 17,599	8,668	26,267	3.0	22,200	1,817	775	24.0	583	36.0	15,315	140	80.2
	1926 16,146	8,643	24,789	5.0	21,080	1,760	778	24.7	606	35.6	15,133	169	79.6
Erie (inc. Chic. & Erie)	1927 34,870	20,801	55,671	7.6	25,990	2,257	953	24.8	517	32.4	12,420	129	57.1
	1926 35,253	21,106	56,359	7.4	25,310	2,226	981	26.6	544	31.5	13,193	129	54.6
Lehigh Valley	1927 23,237	8,947	32,184	9.3	25,536	1,845	805	25.4	481	29.2	11,511	146	53.7
	1926 20,624	10,616	31,240	7.2	23,365	1,782	775	25.5	507	31.1	11,763	157	51.2
Michigan Central	1927 16,840	17,911	34,751	4.1	28,426	1,868	641	19.2	355	30.3	6,771	116	67.0
	1926 17,473	19,338	36,811	4.4	27,087	1,850	631	18.0	342	30.2	6,857	119	63.8
New York Central	1927 70,279	71,026	141,305	3.5	29,333	2,347	988	24.9	455	29.0	9,934	111	54.4
	1926 68,472	72,061	140,533	4.1	26,529	2,159	918	25.1	455	28.5	9,856	125	56.6
New York, Chic. & St. L.	1927 13,162	9,847	23,009	5.5	24,568	1,754	658	20.2	582	44.0	8,044	111	71.1
	1926 13,025	9,825	22,850	5.8	23,324	1,710	667	21.3	634	45.3	8,699	117	73.0
Pere Marquette	1927 10,906	8,793	19,699	3.1	18,512	1,514	619	23.5	459	31.0	4,145	107	67.5
	1926 9,847	9,741	19,588	4.6	17,109	1,454	581	22.4	441	31.0	3,962	114	71.1
Pitts. & Lake Erie	1927 13,646	7,450	21,096	5.8	31,032	2,823	1,591	43.5	296	10.9	26,968	108	55.0
	1926 14,991	7,729	22,720	5.8	26,415	2,393	1,308	40.0	238	9.5	23,343	80	52.6
Wabash	1927 15,071	11,620	26,691	2.8	25,978	1,661	578	19.1	519	42.5	5,548	134	66.2
	1926 14,147	11,243	25,390	2.5	24,769	1,670	642	21.4	615	44.2	6,254	136	69.4
Central Eastern Region:													
Baltimore & Ohio	1927 72,055	32,839	104,894	3.9	21,309	1,959	934	31.6	565	29.0	11,360	154	65.2
	1926 68,680	34,064	102,744	4.6	19,881	1,830	857	29.4	510	27.5	10,079	167	63.2
Central of New Jersey	1927 18,182	11,163	29,345	5.6	19,318	2,007	953	31.2	287	15.5	12,177	155	48.7
	1926 17,331	12,867	30,198	4.4	17,307	1,842	900	32.6	270	13.6	11,819	163	40.7
Chicago & Eastern Ill.	1927 13,798	4,667	18,465	20.7	19,311	1,546	672	26.1	297	18.2	5,804	148	49.0
	1926 14,190	4,112	18,302	17.5	22,005	1,618	712	26.4	321	19.7	6,217	147	51.6
Clev., Cin., Chic. & St. L.	1927 18,388	20,699	39,087	5.6	26,033	1,991	888	28.7	554	32.0	9,117	123	61.3
	1926 18,924	20,751	39,675	4.3	25,036	2,002	912	29.2	536	29.8	8,959	126	57.7
Elgin, Joliet & Eastern	1927 8,997	7,674	16,671	5.1	14,777	2,153	1,115	39.8	290	11.7	10,487	137	52.5
	1926 9,995	7,846	17,841	5.2	15,293	2,256	1,166	38.6	286	11.7	11,109	144	53.7
Long Island	1927 1,739	5,784	7,523	1.3	4,740	901	368	27.7	80	5.3	1,522	287	39.0
	1926 1,999	8,617	10,616	0.7	4,708	848	333	26.0	56	3.9	1,511	318	39.6
Pennsylvania System	1927 216,208	79,703	295,911	4.8	22,122	1,976	901	29.2	442	23.6	12,058	129	51.9
	1926 215,115	88,467	303,582	9.1	20,339	1,843	843	29.3	428	22.9	11,952	136	55.1
Reading	1927 27,148	14,539	41,687	2.4	21,173	1,916	974	35.2	501	23.4	18,489	153	65.7
	1926 25,244	16,898	42,142	3.5	19,870	1,824	918	34.2	466	22.4	17,374	169	58.8
Pocahontas Region:													
Chesapeake & Ohio	1927 28,035	13,397	41,432	2.9	30,037	2,680	1,441	43.0	1,336	54.9	20,889	95	67.0
	1926 30,728	10,472	41,200	3.3	27,472	2,446	1,317	42.5	1,139	47.3	17,709	104	60.6
Norfolk & Western	1927 28,077	8,897	36,974	1.6	38,369	2,880	1,550	43.7	1,177	44.7	19,503	137	58.6
	1926 30,673	9,771	40,444	1.3	33,882	2,703	1,453	42.9	989	38.2	17,923	148	54.1
Southern Region:													
Atlantic Coast Line	1927 22,959	13,100	36,059	3.8	20,008	1,537	555	20.4	441	36.7	3,156	112	61.0
	1926 22,894	21,050	43,944	3.2	17,527	1,468	544	22.0	403	32.0	3,592	126	70.7
Central of Georgia	1927 5,003	5,696	10,699	3.9	18,733	1,328	578	23.6	553	33.2	3,120	135	64.7
	1926 6,007	6,730	12,737	3.7	16,457	1,229	527	25.9	535	33.1	3,574	154	73.6
I. C. (inc. Y. & M. V.)	1927 42,979	24,725	67,704	5.5	21,982	1,699	714	26.7	673	40.2	6,955	129	73.1
	1926 42,584	22,463	65,047	4.3	22,325	1,691	717	26.6	695	41.5	6,898	137	75.2
Louisville & Nashville	1927 44,008	20,679	64,687	8.1	17,014	1,446	688	33.0	643	33.1	8,233	148	89.9
	1926 44,793	18,442	63,235	7.8	15,267	1,314	618	32.6	583	30.9	7,341	166	90.7
Seaboard Air Line	1927 15,028	10,678	25,706	4.3	17,425	1,470	548	22.1	454	34.1	2,753	135	63.1
	1926 12,543	14,308	26,851	1.6	15,895	1,447	565	23.2	447	32.1	3,073	142	74.6
Southern Railway System	1927 56,588	27,148	83,736	5.8	19,346	1,414	568	22.7	476	32.9	4,967	149	59.5
	1926 53,306	30,049	83,355	5.0	17,440	1,349	539	23.3	481	33.5	4,986	161	65.3
Northwestern Region:													
Chic. & North Western	1927 51,218	26,699	77,917	6.6	16,966	1,373	553	22.0	294	20.0	2,705	142	49.6
	1926 48,971	25,997	74,968	7.0	16,694	1,367	533	21.9	333	23.8	2,949	146	52.8
Chic., Milw. & St. P.	1927 53,844	19,874	73,718	5.4	20,429	1,640	677	22.7	440	29.3	2,897	142	55.0
	1926 55,179	20,203	75,382	6.1	19,948	1,633	688	23.4	441	28.7	2,971	143	50.5
Chic., St. P., Minn. & Om.	1927 3,235	8,121	11,356	10.4	14,004	1,119	459	21.5	369	24.9	2,432	134	50.9
	1926 3,123	7,677	10,800	11.4	13,094	1,055	408	20.4	379	28.5	2,252	154	54.8
Great Northern	1927 41,028	7,624	48,652	6.3	23,767	2,016	921	25.8	444	25.2	2,645	133	35.6
	1926 41,526	8,040	49,566	9.9	21,624	1,901	865	24.9	405	23.4	2,442	141	35.1
M., St. P. & S. Ste. M.	1927 19,506	5,323	24,829	4.0	15,923	1,381	588	22.6	373	24.8	2,108	112	50.0
	1926 18,386	5,767	24,153	5.0	14,466	1,282	544	22.1	387	25.9	2,136	118	51.9
Northern Pacific	1927 37,840	7,019	44,859	7.6	23,375	1,846	821	24.1	455	26.7	3,143	143	43.5
	1926 34,403	7,031	41,434	7.6	23,021	1,816	797	23.7	498	29.9	3,167	145	44.3
Oreg.-Wash. R. R. & Nav.	1927 7,360	3,819	11,179	5.0	20,770	1,655	750	24.7	401	21.9	2,072	177	44.3
	1926 7,561	3,148	10,709	6.9	20,362	1,707	784	25.1	433	23.6	2,122	168	43.6
Central Western Region:													
Atch., Top. & S. Fe (incl. P. & S. F.)	1927 58,123	18,103	76,226	6.0	26,197	1,877	681	21.1	498	36.1	3,657	115	69.6
	1926 60,861	15,915	76,776	6.3	24,989	1,781	635	20.8	426	31.9	3,223	124	61.5
Chicago & Alton	1927 10,343	4,727	15,070	3.3	17,944	1,360	497	22.4	288	22.2	4,279	173	60.6
	1926 10,190	4,470	14,660	6.8	18,196	1,456	567	24.5	373	26.1	5,356	179	63.5
Chic., Burl & Quincy	1927 51,029	17,123	68,152	3.9	21,179	1,621	697	24.0	443	28.8	3,233	142	50.8
	1926 52,227	16,529	68,756	5.9	22,363	1,733	772	25.7	537	32.7	3,946	144	50.8
Chic., Rock I. & Pacific	1927 33,175	21,113	54,288	7.0	17,321	1,390	517	21.6	431	32.9	3,093	146	71.4
	1926 34,414	18,438	52,852	10.7	17,757	1,340	495	21.6	421	32.5	2,945	153	67.9
Denver & R. G. Wn.	1927 11,795	2,769	14,564	2.5	17,953	1,706	810	27.1	358	18.6	2,055	179	32.9
	1926 11,793	2,798	14,591	3.2	15,965	1,598	744	26.5	342	18.7	1,955	195	34.7
Oregon Short Line	1927 8,106	5,381	13,487	3.9	23,359	1,716	778	25.6	479	25.7	2,546	121	48.2
	1926 8,163	3,497	11,660	6.2	22,396	1,598	693	25.1	573	33.5	2,634	130	48.7
Sou. Pac.—Pac. Lines	1927 35,121	28,399	63,520	5.0	23,152	1,868	698	23.1	538	37.5	3,921	124	64.4
	1926 32,971	27,863	60,834	6.1	21,896	1,827	706	23.6	532	35.6	3,800	129	63.1
Union Pacific	1927 21,990	8,182	30,172	14.9	34,269	2,097	858	20.8	698	43.9	5,672	110	52.7
	1926 18,330	8,519	26,849	12.6	33,578	2,045	849	21.8	870	54.1	6,327	118	56.1
Southwestern Region:													
Gulf, Colo. & S. Fe	1927 9,594	6,750	16,344	3.3	25,533	1,844	784	27.6	582	35.6	4,918	104	77.4
	1926 9,319	4,170	13,489	2.9	25,058	1,693	710	24.9	462	28.8	3,285	108	68.0
Mo.-Kans.-Tex.	1927 8,846	4,416	13,262	5.1	27,666	2,083	725	21.1	513	43.0	3,804	101	78.3
	1926 8,979	3,667	12,646	4.4	27,978	2,002	738	21.8	472	36.8	3,338	102	62.1
Mo.-Kans.-Tex. of Tex.	1927 262	9,569	9,831	8.4	23,465	1,759	678	24.1	415	30.0	2,940	102	48.9
	1926 340	9,418	9,758	8.6	20,255	1,547	594	22.2	330	24.3	2,317	111	38.6
Missouri Pacific	1927 29,426	21,181	50,607	3.9	19,069	1,576	654	23.5	512	32.8	3,542	132	71.2
	1926 28,866	19,366	48,232	7.3	21,265	1,666	697	24.6	651	41.6	4,293	133	77.4
St. Louis-San Francisco	1927 21,529	10,639	32,168	3.5	18,276	1,441	582	24.1	469	31.6	3,101	154	59.1
	1926 20,017	10,470	30,487	5.2	18,483	1,404	565	24.2	495	34.0	3,080	154	56.3
Texas & New Orleans	1927 11,496	15,234	26,730	5.6	18,148	1,260	509	23.7	501	33.0	2,932	108	82.7
	1926 11,423	13,219	24,642	8.3	17,215	1,225	493	22.6	460	30.8	2,554	113	71.6
Texas & Pacific	1927 6,016	6,491	12,507	3.9	21,466	1,651	598	22.4	628	46.8	4,020	107	75.0
	1926 6,864	5,564	12,428	4.2	20,159	1,597	587	21.4	433	32.6	2,753	111	51.3

News of the Week

(*Continued from page* 2019)

tering service or promotion, have been adopted by the Committee on Forms of the Medical and Surgical section of Division I—Operation, A. R. A., and recommended as standard practice.

Dedicates Bust to C. H. Markham

A bust of Charles H. Markham, chairman of the board of directors of the Illinois Central, erected by shop employees and citizens of Paducah, Ky., was unveiled on the lawn in front of the company's office building in that city on June 15. A special train from Chicago carried Mr. Markham, L. A. Downs, president, A. E. Clift, senior vice-president, J. L. Beven, and G. J. Bunting, vice-presidents, and other officers of the Illinois Central to Paducah for the event. The bust pedestal, which was sculptured by W. F. Engelmann of Chicago, carries the following inscription: "Erected by employees of the Kentucky division of the Illinois Central Railroad and citizens of Paducah as a token of esteem."

Bust of C. H. Markham

Safety Program for July

L. G. Bentley, chairman of the committee on education, of the Safety Section, American Railway Association, has issued circular No. 156 setting forth a proposed schedule of activities for the month of July, following the general scheme of specializing in some one feature of accident prevention in each month of the year.

A comparison and review, taking the years 1923 and 1926, is the subject of the circular. The goal is to make a reduction in casualties of 35 per cent by the end of 1930, as compared with 1923. Each road is reminded that the fact of proportional success thus far does not warrant that the goal will be reached; the fight must be kept up. Each road must not only help to make the national record; it must reduce its own accident rates 35 per cent as compared with 1923.

The roads are congratulated on the fact that casualties to passengers in train accidents have been reduced, per million passenger miles, 24.3 per cent. The railroads are more careful of the passengers than passengers are of themselves, judging by the accident records. The comparisons show that some roads make very much better records than other railroads. Encouraging progress has been made in accident records in railroad shops indicating improvement in supervision, and an intelligent interest in getting injured men back to work.

The records show that 44 railroads have reduced accidents 35 per cent already, 61 have reduced from 15 per cent to 35 per cent; 39 have made a slight reduction and 43 have shown increases. The responsibility of officers and supervisors for the prevention of accidents is a matter which should be constantly emphasized.

U. S. Army Reserve Corps News—Railway Units

Francis G. Hoskins, division superintendent, Baltimore & Ohio, with headquarters at Baltimore, Md., has been appointed major, Engineer Reserve.

Wm. Dudley Simpson, assistant engineer maintenance of way, Seaboard Air Line, with headquarters at Savannah, Ga., has been appointed major, Engineer Reserve.

First Lieutenant John Charles White, Engineer Reserve, supervisor of tracks, Pennsylvania, with headquarters at Tyrone, Pa., has been assigned to the 492nd Railway Engineer Battalion.

First Lieutenant Harry E. Wolf, Engineer Reserve, relief agent, Illinois Central, with headquarters at Memphis, Tenn., has been assigned to the 593rd Railway Engineer Battalion.

First Lieutenant Henry L. Stanton, Engineer Reserve, engineer telegraph and signals, Pennsylvania, Central region, with headquarters at Chicago, has been assigned to the 493rd Railway Engineer Battalion.

First Lieutenant John L. Gressitt, Engineer Reserve, division engineer, Pennsylvania, with headquarters at Johnstown, Pa., has been assigned to the 493rd Railway Engineer Battalion.

First Lieutenant James Fogarty Barnett, Engineer Reserve, enginehouse foreman, Illinois Central, with headquarters at Memphis, Tenn., has been assigned to Company C, 593rd Railway Engineer Battalion.

Captain Thomas P. Crymes, Jr., Engineer Reserve, track supervisor, Illinois Central, with headquarters at Memphis, Tenn., has been assigned to Company A, 593rd Railway Engineer Battalion.

Second Lieutenant Henry Illen Hoag, Engineer Reserve, general supervisor of track, New York Central, with headquarters at New York, has been assigned to the 489th Railway Engineer Battalion.

First Lieutenant James S. Richards, Engineer Reserve, master mechanic, Pennsylvania, Central region, with headquarters at Steubenville, O., has been assigned to the 493rd Railway Engineer Battalion.

Captain Fred F. Wright, Engineer Reserve, traveling engineer, Illinois Central, with headquarters at Memphis, Tenn., has been assigned to the 593rd Railway Engineer Battalion.

Traffic

The Toledo, Peoria & Western has announced the opening of a traffic office at 1502 Marquette building, Chicago, which will be in charge of Martin L. Schultz, general agent.

A general investigation of rates and regulations governing the transportation of live stock has been announced by the Railroad Commission of Texas. The investigation is to be made on the commission's own motion in conjunction with a similar inquiry to be made by the Interstate Commerce Commission, on dates and places to be announced.

The Better Poultry train which the Chicago & Eastern Illinois operated in Illinois and Indiana during April and May, was visited by over 44,000 people. The largest attendance in Illinois was in Marion with 2,500 and in Indiana at Shelburn with 2,150. Egg and poultry shows were held in most of the towns at the time the train was present and prizes were given by the business men to the best exhibits.

A preliminary estimate by the Canadian Pacific of the wheat crop in Manitoba, Saskatchewan and Alberta shows a decrease in the acreage of 1927 as compared with 1926 of 2,104,964 acres. For 1927, wheat acreage is estimated at 1,714,379 in Manitoba, 11,950,073 in Saskatchewan, 5,808,698 in Alberta—a total of 19,473,150 acres. The acreage for 1926 was 2,285,838 in Manitoba, 13,277,858 in Saskatchewan, 6,114,418 in Alberta—a total of 21,678,114 acres.

The Boston & Maine announces for the summer tourist and vacation business a new daily train "The Mountaineer" between Boston, Mass., and Intervale, N. H., leaving Boston at 12:15 p.m., Eastern time, except Sunday; and also a new evening train from Boston on Fridays. This is the shortest line with the lowest fare between Boston and the White Mountains. Additional trains are to be put on also between Boston and points in eastern Maine, New Brunswick and Nova Scotia.

The Interstate Commerce Commission on June 21 made public a proposed report by John L. Rogers, special examiner, recommending a finding by the commission on the complaint filed by T. N. and B. B. Sample et al., v. Atchison, Topeka & Santa Fe et al., that the allegation that the railroads had neglected to make provisions for the furnishing of an adequate number of cars for the transportation of grapes from California has not been sustained. He also recommends a finding that the rules and practices of the railroads with respect to furnishing refrigerator cars for grape loading in California during periods of car shortage, commonly referred to as the "grape car plan," are not unreasonable.

The evidence of record, the examiner says, shows that some such plan as is here under consideration is necessary in order

to enable the carrier to distribute cars among shippers in accordance with the requirements of the law.

The Interstate Commerce Commission has issued a decision finding justified and vacating its suspension of a tariff rule governing the furnishing of cars for loading grain products in western trunk line and southwestern territories. The rule provides that the carriers will furnish suitable cars with tight roofs and sidings and with interior free of debris, noxious odors, oil spots or acid spots, likely to damage the lading, also reasonably free from nails and projections likely to tear sacks, but that they will not sweep, pad, line, or weatherstrip cars nor furnish material therefor. The Southwestern Millers' League had protested against the refusal to weatherstrip or furnish the material therefor.

The Duluth & Iron Range

The Duluth & Iron Range has issued an illustrated booklet entitled, "Transportation of Iron Ore," covering in some detail every phase of the operation and the physical facilities of this railroad. This company was incorporated on December 21, 1874, to construct a line from Duluth, Minn., to Two Harbors and thence north and west to a group of iron mines controlled by the incorporators. Chapters are devoted to the transportation department, the ore and coal docks, the engineering and all other departments; to the veterans' association and to the logging operations and the agricultural resources of the territory.

Trans-Missouri-Kansas Advisory Board

The 1927 crop throughout the winter wheat belt will very closely approximate that of the 1926 season, it was estimated at the eighteenth quarterly meeting of the Trans-Missouri-Kansas Shippers' Advisory Board at Wichita, Kan., on June 15. It is now expected that Kansas alone will produce about 130,000,000 bushels.

Carl R. Gray, president of the Union Pacific, and Homer Hoch, Congressman from the Fourth District of Kansas, addressed the 600 shippers and railroad representatives that attended the meeting. Of the 26 lines of industry reporting, 17 indicated an increase in car requirements for the third quarter ranging from 1 per cent to 136 per cent over the corresponding quarter of 1926. The remaining nine lines of industry expected decreases ranging from 4 per cent to 29 per cent.

Fresh fruits and fresh vegetables are expected to increase 60 per cent and 136 per cent. Industries in which substantial increases were reported are as follows: hay, 12 per cent; lime, plaster and gypsum, 12 per cent; sand, stone and gravel, 15 per cent; dairy and poultry products, 10 per cent; automobiles, 20 per cent. Ores and potatoes will move in quantities that are 29 per cent and 23 per cent less than for the third quarter of 1926.

Government Study of Freight Containers

T. E. Lyons, chairman of the United States Commerce Department's domestic packing advisory board, who has recently completed a survey of the freight container problem, extending over two years, says that five billion containers are used annually to carry the many different commodities requiring protection in commerce. Fully 90 per cent of these containers are new ones. It is only natural that in the movement of valuable merchandise in such a large number of containers losses are likely to occur. But within the past two or three years manufacturers have awakened to the fact that it is necessary to apply to distribution methods the same intelligent engineering skill, research and organization as are applied to production methods.

The government researches are now available in a series of bulletins covering seven distinct types of containers: fiber containers, plywood boxes, wirebound boxes, wooden boxes, cooperage and steel barrels, crates and bales. The bulletins are issued by the Bureau of Foreign and Domestic Commerce, Washington.

An Inside Picture of the Freight Claim Department

The Atlantic Coast Line, operating 5,000 miles of railroad, pays out about $24,500 a month for overcharges on freight. Discussing this subject briefly, and cautioning its patrons against patronizing claim brokers, the company has issued a circular assuring shippers and consignees that it spares no expense or effort to see that sums due to be refunded are promptly paid.

The circular says that overcharges are generally refunded in from 30 to 45 days. It is silent, however, as to how long it takes to collect the $31,000 of undercharges which its auditors discover in the average month. Continuing, the circular says:

"Freight charges are shown by printed tariffs, but it sometimes happens that mistakes are made and charges that are too low or too high are collected. The Atlantic Coast Line, handles an average of about 425,000 separate shipments a month. The average number of over and undercharges is about 4,800 a month or about 1.1 per cent. While most of these cases involve small amounts, every provision is made to carry out promptly the spirit and the letter of the law requiring the collection of the exact authorized charge.

All Coast Line agents are instructed to check all waybills and to refund immediately any overcharge that is detected. The Coast Line maintains a revision bureau at one of its large transfer stations, and contributes to the support of two others, and all waybills are checked by a force of auditors. This audit results in finding about 2,000 overcharges a month, involving a total of about $24,500. It finds also an average of 2,800 undercharges amounting to about $31,000.

It is impossible to settle promptly about 35 per cent of the overcharges which are detected by the Coast Line's auditors and for which refund is offered, because some patrons turn their freight bills over to claims brokers and allow them to file claims for items they think can be collected.

These brokers ordinarily charge a commission of 50 per cent of the amounts they collect on overcharge claims. On this basis it is estimated that patrons of the Coast Line who allow claims brokers to undertake such collections lose annually more than $50,000 that would otherwise be refunded by the Coast Line without effort or cost to them.

The average number of overcharge claims filed with the Coast Line is 2,313 per month. Of this number 746 claims, or about one-third are found to be entirely without basis and are not paid. Of the remainder a very large part are detected by the auditors in advance of the receipt of claim . . . One broker operating in Tampa has recently completed a penitentiary sentence for improper practices in connection with a claim he had filed for a business house.

The Atlantic Coast Line spares no expense or effort to see that refunds due on overcharges are made promptly and correctly, and it feels that its patrons can save money by handling all such matters with it direct instead of through a third party.

April Freight Traffic

Freight traffic carried by the Class I railroads in April amounted to 37,101,687,000 net ton-miles, according to reports compiled by Bureau of Railway Economics. This was an increase of 801,527,000 net ton-miles or 2.2 per cent over April, 1926, and 10.5 per cent over April, 1925. In the eastern District, the increase was 3.3 per cent, in the Southern district six-tenths of one per cent, and in the Western 1.3 per cent.

The record for the first four months was 155,394,137,000 net ton-miles, the greatest ever reported for that period, and an increase of 7,344,679,000 net ton-miles (5 per cent) over the best previous record established, (1926.) It also was an increase of 11.4 per cent over 1925. Four months in the Eastern district showed an increase of six per cent, but the Southern District reported a decrease of one-half of one per cent. In the Western district, an increase of 5.9 per cent was reported.

The average daily movement of freight cars in April, according to the Bureau, was 29.5 miles, the highest for that month ever attained. This was an increase of one-half mile above that for April last year and of 2.9 miles above April, 1925.

The average load per car in April was 26.2 tons, one-tenth ton over April 1926, and three-tenths ton over April, 1925. It also was an increase above the average for April, 1922 and 1924 but was a decrease compared with 1920 and 1923.

An Enginehouse on the Eureka Nevada at Palisade, Nev., was destroyed and six locomotives were damaged by fire on June 12. The fire also destroyed a trestle connecting the Southern Pacific tracks with the Eureka Nevada.

Foreign

Colombia to Spend Millions on Railways

Proceeds of a $60,000,000 loan for which bids were opened in Bogota, Colombia, on June 16, are to be devoted chiefly to the construction of three railroad lines already in progress, viz., the Central del Norte, the Pacifico and Troncal de Occidente, according to a statement of the Colombian consul-general in New York.

Germany and Britain Cater to Passenger Traffic

Railroads in Germany have announced that, to encourage week-end travel, a minimum guarantee of only 100 marks, or about $25, will be required for a special train to carry parties over the lines. Another provision was announced which arranges it so that a special train can be run whenever 70 purchasers of second class, or 100 purchasers of third class, or 150 of fourth class tickets, make the necessary demand.

An attempt to encourage travel in England has been made by issuing trip tickets for tours at a rate about 25 per cent cheaper than the regular ticket. The tour tickets are good for two months and carry stop-over privileges at any point. The tickets are good on any of the English lines and are issued for about 196 separate tours in Great Britain and Ireland.

Great Southern of Ireland Profit

The report of the Great Southern Railway for 1926 shows that receipts amounted to about $21,000,000 and expenditures to about $19,000,000, leaving net receipts of about $2,000,000, a figure considerably higher than that for 1925. It is evident that but for the miners' strike in Great Britain, the company would have had a comparatively prosperous year. The interruption of freight traffic by the strike affected the volume of receipts, while expenses were increased considerably by the high price of import coal. However, the operating revenues of the railway for the first eight weeks of 1927 show an increase of about $126,000 over the corresponding figures for last year. The number of passengers carried on the Great Southern during 1926 was 12,585,652, yielding total receipts which amounted to about $6,000,000. Freight receipts amounted to about $11,000,000.

Bombay to Remodel Railway Terminal

The Great Indian Peninsular Railroad has started to remodel its terminus in Bombay to accommodate the increasing number of passengers, according to advices from Vice-Consul Beach, Bombay, made public by the Department of Commerce. It is expected in Bombay that the entire work will be completed in 1928 at an estimated cost of $3,000,000.

The main feature of the construction will be the separation of local from long distance traffic by a new building for distance traffic alone. Four platforms for main line trains and nine for local and suburban trains, all of which will eventually be operated by electricity, are planned.

The new main station building will be a four-storied, steel frame, fireproof structure for the separate accommodation of first and second-class long-distance traffic. A refrigerating plant and cold storage rooms will be provided. The floors will be of reinforced concrete.

British Institute of Transport Congress

The sixth meeting of the Institute of Transport of Great Britain was held in Birmingham on May 18-20. Addresses were delivered by J. H. Follows, vice-president of the executive, London Midland & Scottish, who spoke on "Traffiic Control on the Railways"; George Cadbury, a manufacturer, who spoke on "Industry and Transport"; E. S. Schrapnell-Smith, president, Commercial Motor Users' Association, and W. P. Robinson, county surveyor for Surrey, whose subject was "Highway Cost per Ton-Mile of Traffic," and C. Grant Robertson, principal of the University of Birmingham, who presented a paper on "Transport in England."

It was brought out in the discussion that the institute had firmly established itself among the professional societies of the country, having obtained a membership of 2,500.

Roger T. Smith, a consulting electrical engineer, was elected president of the institute for the ensuing year.

Electrification Increases Train Loads in Switzerland

In the year 1924 the St. Gothard railway succeeded in transporting 19,000 tons of merchandise on one single day—a record which was not expected to be beaten. But with the progress of electrification and a steady increase of coal transportation from the North to the South the figures of 1924 have now been surpassed. On February 25, 1926, a total of 23,000 tons of coal were carried southward over this famous line.

To handle this huge shipment 42 freight trains were necessary on the Erstfeld-Göschenen section; i.e. 18 trains of 700 to 1,000 tons each, drawn by two locomotives, and 24 trains of 300 to 500 tons each, drawn by one locomotive. At Göschenen, which is the highest point of the railway, elevation 3,640 feet, these trains were filled out so that a total of 24 trains with one locomotive each had to pass through the tunnel and descend towards Bellinzona.

If steam traction had still been in use, it is asserted, the transporting of 23,000 tons of coal in one day would have necessitated 138 locomotives and 46 through trains from Erstfeld to Bellinzona, while on February 25, 1927, these 23,000 tons were hauled with the aid of 60 electric locomotives north of the tunnel and 24 only on the south.

Equipment and Supplies

Locomotives

THE MISSOURI PACIFIC is inquiring for five Mikado-type locomotives.

THE DENVER & RIO GRANDE WESTERN is inquiring for from two to four 2-8-8-2 Mallet type locomotives.

THE IQUIQUE PINTADOS (Chile) is inquiring through the locomotive builders for five Mikado type locomotives.

HIRAM RICKER & SON, Poland Springs, Maine, has ordered one six-wheel switching locomotive from the American Locomotive Company.

Freight Cars

THE CHICAGO & NORTH WESTERN is inquiring for 25 caboose car underframes.

THE ARMSTRONG CORK COMPANY, Lancaster, Pa., contemplates buying about seven tank cars.

THE CHICAGO & ILLINOIS MIDLAND is inquiring for 200 steel underframe box cars, of 40 tons' capacity.

THE UTAH RAILWAY has ordered one caboose car from the Mount Vernon Car Manufacturing Company.

THE GEORGIA & FLORIDA has ordered 60 box cars from the American Car & Foundry Company. In the *Railway Age* of April 16 it was reported that this company contemplated buying about 80 box cars.

THE DULUTH, MISSABE & NORTHERN has ordered 125 ore cars of 70 tons' capacity from the General American Car Company and 125 from the Standard Steel Car Company. Inquiry for this equipment was reported in the *Railway Age* of June 18.

THE LITCHFIELD & MADISON has ordered 100 composite drop bottom gondola car bodies and 147 solid bottom gondola car bodies, all of 50 tons' capacity and 41 ft. long, from the American Car & Foundry Company. In the *Railway Age* of May 28 this company was reported as asking for prices on the repair of 247 gondola cars.

Passenger Cars

THE NORTHERN PACIFIC has ordered 10 steel underframes for baggage cars from the Siems-Stembel Company.

THE LEHIGH & NEW ENGLAND has ordered one all-passenger, gas-electric rail motor car from the J. G. Brill Company.

THE ATCHISON, TOPEKA & SANTA FE has ordered two 72-ft. passenger and baggage, gas-electric rail motor cars from the Electro-Motive Company.

THE ILLINOIS CENTRAL has ordered 10 baggage cars from the St. Louis Car Company. Inquiry for this equipment was reported in the *Railway Age* of May 7.

THE NORFOLK & WESTERN has ordered 25 all steel storage mail cars from the Bethlehem Steel Company. Inquiry for this equipment was reported in the *Railway Age* of June 18.

THE CHICAGO, BURLINGTON & QUINCY has ordered five lounge cars from the Pullman Car & Manufacturing Corporation. Inquiry for four cars was reported in the *Railway Age* of May 28.

THE SEABOARD AIR LINE has ordered nine gas-electric rail motor cars and 10 trailer cars from the American Car & Foundry Company and the J. G. Brill Company. In the *Railway Age* of June 4 it was reported that this company was inquiring for from 10 to 12 gas-electric combination passenger and baggage cars, 10 to 12 gas-electric baggage cars and 20 to 24 trailer cars.

Iron and Steel

THE BALTIMORE & OHIO is inquiring for 150 tons of steel for bridges.

THE PENNSYLVANIA has ordered 250 tons of steel from the McClintic-Marshall Company for use at Toledo, Ohio, and has ordered 125 tons from the American Bridge Company, for use at Cresson, Pa.

Machinery and Tools

THE MISSOURI PACIFIC has ordered one 25-ton, 3-motor overhead traveling crane from the Whiting Corporation.

THE ILLINOIS CAR & MANUFACTURING COMPANY has ordered a 48-in. car wheel borer from the Niles-Bement-Pond Company.

THE CHICAGO, ROCK ISLAND & PACIFIC has ordered two 25-ton locomotive cranes from the American Hoist & Derrick Company.

THE AMERICAN LOCOMOTIVE COMPANY has ordered one extra heavy end driven axle lathe, from the Niles-Bement-Pond Company.

THE ST. JOHNS RIVER TERMINAL COMPANY, Washington, D. C., has ordered a 5-ft. Ridgway radial drill from the Niles-Bement-Pond Company.

THE ATCHISON, TOPEKA & SANTA FE has ordered one No. 5 center drive car wheel lathe, and a No. 3 axle lathe, from the Niles-Bement-Pond Company.

THE NEW YORK CENTRAL is inquiring for five machine tool lathes. An order for a 90-in. locomotive motor axle journal turning lathe has been given to the Niles-Bement-Pond Company.

Signaling

THE PENNSYLVANIA has ordered from the Union Switch & Signal Company, an electro-pneumatic interlocking, 59 levers, for Cabin R. Sunnyside yard, New York.

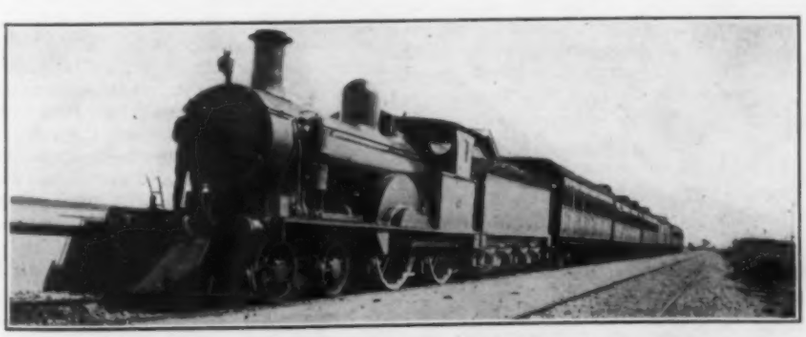
THE SEABOARD AIR LINE has ordered from the Union Switch & Signal Company an electro-mechanical interlocking for Hawthorne, Fla.; six working mechanical levers and three electric units.

THE AMERICAN LOCOMOTIVE COMPANY has ordered from the General Railway Signal Company 15 sets of automatic train-control apparatus, to be used on locomotives being built for the New York Central Lines.

Miscellaneous

THE BUREAU OF MINES is inquiring for one mine rescue car.

THE PENNSYLVANIA has placed with the Westinghouse Electric & Manufacturing Company a large order for switching equipment for installation on the Philadelphia to Wilmington electrification project. The order includes 39 high speed oil circuit breakers and the relays for the operation and protection of 11,000-volt trolleys. The breakers are rated at 1,500 amperes and insulation is provided to permit a wet test of 112,000 volts. The combined maximum operating time of the breakers and the relays under short circuit conditions is .04 seconds. This high speed action is necessary to prevent interference with parallel telephone cables. The order also includes seventeen 66,000-volt outdoor potential transformers, six type O-331 oil circuit breakers, fifty type SV lightning arresters and choke coils, and three large grounding resistors.



A Local Passenger Train on the South Australian Railways

Supply Trade

J. F. Shouse & Co., 1197 Starks building, Louisville, Ky., has been appointed sales representative for the state of Kentucky and the southern part of Indiana, of the Whiting Corporation, Harvey, Ill.

The C. O. Bartlett & Snow Company, Cleveland, Ohio, makers of elevators, conveyors, dryers and complete handling systems for mill and factory, have opened a district office at 406 Bessemer building, Pittsburgh, Pa., in charge of **W. C. Schade.**

M. S. McNay, formerly sales manager of the Bock Bearing Company, Toledo, Ohio, has been appointed western railway sales representative of **S. K. F. Industries, Inc.,** with headquarters at 1140 W. Washington boulevard, Chicago.

The Graybar Electric Company, New York, has taken over the distribution of the poles of the **International Creosoting & Construction Company,** Galveston, Tex., and with a few territorial exceptions, the Graybar Company will handle creosoted southern pine through all of its sixty-one distributing houses. The recent completion of a large treating cylinder at the Texarkana plant of the International Company has doubled its plant capacity.

The Foos Gas Engine Company, Springfield, O., has changed its name to the **Foos Engine Company.** The following officers have been elected: **J. F. Baker,** president; **M. E. Baker,** secretary-treasurer; **Ray C. Burrus** has been appointed sales manager; **W. W. Schettler** has been appointed chief engineer, and **George F. Noltoin** mechanical engineer. The company will establish a factory branch at Tulsa, Okla., and the branch staff will include sales representatives and service engineers. **Garvey & Palmer, Inc.,** who are the company's Pacic Coast representatives. have established offices in Los Angeles, San Francisco and Seattle.

Earle M. Harshbarger, who has become associated with the **S. K. F. Industries, Inc.,** New York, where he will handle railroad and engineering sales in the territory east of Pittsburgh, was previously in the service of F. S. Bowser & Co., of Fort Wayne, Ind. He was born in Ladoga, Ind., April, 1887, and attended the public and high schools in that city, later attending Wabash and Purdue Universities. He entered the service of S. F. Bowser & Co., manufacturers of oil storage equipment, in 1915, and after remaining at the home office for three years was transferred to the Chicago office where he was in sales work for two years. He then went to St. Louis as assistant district man-

ager of that territory. For the year that he was at St. Louis he specialized in railroad work. He then returned to the home office as manager of the railroad department where he remained for five years, at the same time being manager of the government sales department. Following that he was appointed district manager of the New York office with special attention to railroad work, a position he held until June 1 of this year.

National Bearing Metals Corporation

The National Bearing Metals Corporation has been formed, incorporated under the Laws of New York State, with offices at St. Louis, Mo., and New York, N. Y., through the merger of Bronze Metal Company, New York, More-Jones Brass & Metal Company, St. Louis, Mo., and Keytsone Bronze Company, Pittsburgh, Pa.

During the past few months, Bronze Metal Company has acquired the business and properties of Brady Brass Company, Jersey City, N. J., Southern Brass Works, Inc., Portsmouth, Va., and Damascus Bronze Company, Pittsburgh, Pa., all of which now will be operated by, and under the name of National Bearing Metals Corporation, with plants located at the following points: St. Louis, Mo., Pittsburgh, Pa., Meadville, Pa., Jersey City, N. J., and Portsmouth, Va.

The St. Louis office will be at 4930 Manchester avenue, and the New York office at 30 Church street.

The National Bearing Metals Corporation will specialize in the manufacture of railroad engine and car bearings, bronze and brass castings, motor axle and armature bearings, trolley wheels, babbitt metal, etc.

The management of the new corporation will include Alexander Turner, chairman of the board, John B. Strauch, president, Thomas H. Wright, vice-president, Arthur N. Dugan, vice-president, S. W. Crawford, vice-president, W. K. Frank, vice-president, A. Y. Evins, vice-president, R. S. Herman, vice-president, Frank H. Senn, secretary and assistant treasurer, and J. A. Neuwirth, treasurer and assistant secretary.

Obituary

Louis S. Ross, president of the Central Railway Signal Company, Newton, Mass., died on June 10.

John M. Goodell, formerly associate editor of Engineering News, and a well known writer on technical subjects, died at the French Hospital, New York, June 21, at the age of 59.

Bradford McIntyre, traveling representative since 1925 of the Pittsburgh Screw & Bolt Corporation, Pittsburgh, Pa., died suddenly on June 8, while on a business trip at Miami, Fla. Mr. McIntyre was 47 years of age at the time of his death.

Construction

ATCHISON, TOPEKA & SANTA FE.—A contract for the construction of buildings in connection with the enlargement of the engine terminal at Emporia, Kan., has been let to C. A. Fellows, Los Angeles, Cal. The structures included in this contract are a 50-stall concrete and brick roundhouse, a one-story apprentice school, a two-story brick locker building, a one-story office building, a brick ice house and a power house. Contracts will be awarded at some future date for cinder and sand handling facilities and a coaling station. Grading, track laying and bridging in connection with the terminal will be done by company forces.

BANGOR & AROOSTOOK.—This road plans to build a 400-ton steel bridge at Houlton, Maine.

BESSEMER & LAKE ERIE.—This road will replace the present timber bridge at Black's Run, Pa., with a new steel bridge, to have a concrete floor. The work will be done by company forces, and will cost about $30,000.

CENTRAL OF NEW JERSEY.—This company, on June 20, opened bids for the construction of a 6-stall roundhouse at Bethlehem, Pa., and later decided to increase the specifications to cover a 16-stall roundhouse at that point, for which bids will shortly be asked.

CHICAGO & NORTH WESTERN.—Bids will be received until June 27 for the remodeling of a boiler house at the Chicago Avenue terminal, Chicago, at an approximate cost of $12,000. This company plans the construction of a two-stall enginehouse at Linwood, Neb.

CHICAGO, ROCK ISLAND & PACIFIC.—This company plans the remodeling of its freight station at Iowa City, Ia.

DELAWARE, LACKAWANNA & WESTERN.—A contract has been awarded to James S. McCormack Company, Easton, Pa., for the construction of a new arch bridge at Alexander, N. Y., to cost about $50,000.

ERIE.—This road has contracted for the work of lowering streets along the main line at Jersey City and for paving work in connection with the reduction of the street approaches. Frank Brown, Inc., of Jersey City, has the contract, and the work will cost around $90,000. The work is in connection with increased trackage which the road intends to lay in the near future.

GRAND TRUNK WESTERN.—A contract for the grading of the Pontiac Belt Line and for the grading in connection with the extension of the yards at Pontiac, Mich., has been let to the Jones Contracting Company, Cleveland, Ohio. The total amount of excavation involved in this work is about 200,000 cu. yd.

GREAT NORTHERN.—A contract has been let to George H. Moon, Bellingham, Wash., for the construction of a station at Bellingham at a cost of about $60,000. Outside dimensions of the building will be 40 ft. by 110 ft.

LEHIGH VALLEY-PENNSYLVANIA.—These roads will open bids, about July 1, for construction work in connection with the building of a joint double-track bridge across Newark Bay. The bridge will be about 8,000 ft. long. The plan for it was reported in *Railway Age* of May 7, 1927, page 1418.

MISSISSIPPI RIVER & BONNE TERRE.—A contract for the construction of a 200-ton reinforced concrete automatic electric conveyor type coaling station at Bonne Terre, Mo., has been let to Fairbanks Morse & Co., Chicago.

MISSOURI-KANSAS-TEXAS.—Bids will close on June 27 for the construction of a freight warehouse and station at Houston, Tex., consisting of a one and two story structure with units having outside dimensions of 50 ft. by 380 ft., 50 ft. by 81 ft., and 40 ft. by 81 ft., respectively and a reinforced concrete and steel covered shed with dimensions of 16 ft. by 402 ft.

MISSOURI PACIFIC.—Bids will close on July 6 for the construction of a water treating plant at Hermann, Mo., at an estimated expenditure of $30,000.

NEW YORK CENTRAL.—This road plans to build a 250-ton steel bridge at East Creek, N. Y.

NEW YORK CENTRAL.—This company has received bids for the alteration of the ferry terminal at Weehawken, N. J., but the award has been temporarily delayed. The alteration will consist principally in renewing the ferry bridges and the installation of modern mechanical operation. The road has asked for bids for the construction of a water intake for the power station at Port Morris, N. Y. It will also close bids on June 28 for the construction of a foundation for a turbine generating plant at Yonkers, N. Y. Bids were opened, June 21, for the construction of a sub-station at Phillips Manor, N. Y., which will cost about $100,000. The road has awarded a contract to the Walsh Construction Company, Davenport, Ia., for the construction of a 31-stall roundhouse at Harmon, N. Y., to cost approximately $470,000, for which bids closed June 14.

SOUTHERN PACIFIC.—The Interstate Commerce Commission has received a letter from Guy V. Shoup, general solicitor of the Southern Pacific, advising that construction of the line authorized to be built by the Central Pacific from Cornell to Alturas, Cal., was commenced on June 14 by commencing the grading of the roadbed. The letter referred to the commission's certificate of May 3, 1926, and the amendatory order of May 3, 1927, authorizing the construction on condition that it be commenced by June 17 and that, among other things, written report be given the commission within 15 days.

READING.—This road has given a contract for a 200-ton bridge to the Shoemaker Bridge Company.

Railway Finance

BALTIMORE & OHIO.—*New Stock Issue.*—This company has filed its application to the Interstate Commerce Commission for authority to issue $63,242,500 of additional common stock, to be offered to stockholders at 107½. An agreement has been entered into with Kuhn Loeb & Co., and Speyer & Co., to underwrite the issues for a compensation of $2.25 per share.

BANGOR & AROOSTOOK.—*To Issue Stock.*—Directors, meeting at Bangor on June 21, voted to increase the common stock of the company from 77,200 to 112,200 shares and to offer 29,360 of these new shares to stockholders at a subscription price of $60 a share, the remaining 5,640 shares to remain in the treasury. It was also voted to increase the annual dividend rate on the increased common stock to $3.50 as compared with the present annual rate of $3. A special meeting of the stockholders has been called for July 19 to ratify these proposals. The stock of the company is of $50 par value. Holders of Bangor & Aroostook preferred, of record July 19, will be permitted to subscribe for two shares of the new common for each five shares of preferred owned, and common stockholders of record the same date will be permitted to subscribe for one share of the new common for each five shares of common held.

BANGOR & AROOSTOOK.—*Stock financing rumor.*—It is reported that this company is considering financing through the issue of common stock. The figure of 25,000 additional shares is mentioned, to be allotted to present holders at about $60 on the basis of one of the new shares for each two or three now held.

BUFFALO, ROCHESTER & PITTSBURGH.—*Bonds.*—The Interstate Commerce Commission has authorized an issue of $3,536,000 of 4½ per cent consolidated mortgage bonds, to be sold at not less than 94.

BULLFROG GOLDFIELD.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon its line, from Goldfield to Beatty, Nevada, 79 miles, stating that it was built under the stimulus of a mining boom that collapsed and that there is no reasonable ground for hoping that it can for a long time, if ever, be operated at a profit.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—*Hearing on Reorganization Postponed.*—The Interstate Commerce Commission has postponed from June 23 to July 6 the hearing before Director Mahaffie of its Bureau of Finance on the application of the new company for authority to take over the properties of the Chicago, Milwaukee & St. Paul and to issue its new securities in accordance with the reorganization plan.

DELAWARE, LACKAWANNA & WESTERN.—The Interstate Commerce Commission has made public a report proposed by C. E. Boles, attorney-examiner, recommending a denial by the commission of the supplemental applications for modification of orders authorizing the New York, Lackawanna & Western to issue $13,635,000 of first and refunding mortgage bonds, the Morris & Essex to issue $11,000,000 of construction mortgage bonds and the D. L. & W. to guarantee the bonds, so as to permit the D. L. & W., to dispose of the bonds to the Lackawanna Securities Company. The report says that so long as the D. L. & W. holds the bonds in its treasury it is under no liability on account of them but that the plan of disposition of them proposed "would materially increase its interest burden without apparent necessity." It is also stated that the transactions proposed are tantamount to a distribution of the Lackawanna's own bonds as a dividend, such as the commission found not justified when the Chicago, Burlington & Quincy proposed such a plan several years ago.

ERIE.—*Equipment Trust.*—This company has applied to the Interstate Commerce Commission for authority to assume obligation and liability in respect of $6,422,000 of 4½ per cent equipment trust certificates, to be sold to the highest bidder. The company has invited twelve banks to bid.

GULF & SABINE RIVER.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon 8.96 miles of line in Vernon Parish, La.

MICHIGAN CENTRAL.—*Annual Report.*—Annual report for 1926 shows net income after interest and other charges of $18,963,899, equivalent to $101.21 a share on the outstanding capital stock. Net income in 1925 was $18,806,194 or $100.36 a share. See excerpts from annual report appearing on adjacent pages.

MISSOURI & NORTH ARKANSAS.—The Interstate Commerce Commission has authorized an issue of $282,000 of 6 per cent receiver's certificates.

NEW YORK CENTRAL.—*Acquisition*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the Middleport & Northeastern, which has a line from Rockville, Ohio, to Calvin, 2.5 miles, by purchase of its stock for $1,000.

NEW YORK CONNECTING.—*Tentative Valuation.* — The Interstate Commerce Commission's tentative valuation report, finding a final value for rate-making purposes of $24,500,000 as of 1918, includes some discussion of its original cost. It reports a recorded money outlay of $27,441,115 and $89,000 of preferred stock issued for organization expenses, saying: "We are not able to report the cash value at the time of the transaction of the outlay other than money because it has not been possible to obtain the information. There is included some or all of the cost of the non-carrier lands including improvements owned." It is pointed out, however, that the cost of the common-carrier property, approximately $24,500,000, was for the most part incurred in 1915-1918 when prices were higher than in the 1914 pricing period used in formulating estimates of reproduction costs for property other than land and that "if the prices prevailing at the time of the construction of the carrier's property were removed from consideration, the value of the property would be $22,500,000 instead of the $24,500,000 found." The capitalization as of valuation date was $27,450,000.

NORTHERN OF NEW JERSEY.—The Interstate Commerce Commission has authorized this company to issue $707,000 of general mortgage 4½ per cent bonds to be sold at not less than 98½ with a commission of 2 per cent, the proceeds to be used to retire certain bonds. The Erie was also authorized to guarantee the bonds.

NORTHERN PACIFIC. — *Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon about 18 miles of its line between Pinehurst, Mont., and Trout Creek.

NORTHERN RAILWAY SYSTEM.—*Merger Plan Declared Operative.*—The plan for the merger of the Northern Pacific and Great Northern through stock ownership and lease has been declared operative by the deposit committee. The committee also approved application to the Interstate Commerce Commission for approval of control of the two companies and of the Spokane, Portland & Seattle, now owned by them jointly, by a new company to be incorporated under the laws of Delaware to be known as the Great Northern Pacific Railway Company. The plan provides for the new company, (1) to take a lease of the Spokane, Portland & Seattle, (2) to acquire the stock of the Northern Pacific and Great Northern by exchange therefor on a share for share basis of stock of the new company and (3) to take leases of the properties of the two northern companies.

The committee announced that more than 70 per cent of the outstanding stock of the Northern Pacific and the Great Northern had been deposited for exchange for the new company's stock and that the time for further deposits had been extended indefinitely.

The committee also made public the terms of the leases and noted that they had been approved by the boards of directors of the Northern Pacific and Great Northern. The announcement of this point stated:

"The leases covering the properties of the two Northern companies are identical, except for necessary differences in the descriptions of the property transferred. In addition to its undertaking to pay each Northern company taxes, rentals, interest on funded debt and other fixed charges, the new company agrees that when it pays any dividend upon its common stock, which it will issue to the exchanging stockholders of the Northern companies, it will at the same time and at the same rate per share make payments to non-exchanging stockholders. At the termination of the leases, the new company, in addition to returning to the Northern companies or accounting to them for all of their properties transferred under the leases, will account to the Northern companies for all surplus accumulated and not distributed during the term of the leases earned from the operation of the properties of

(*Continued on page* 2029)

Annual Report

Michigan Central Railroad Company—Annual Report

To the Stockholders of
THE MICHIGAN CENTRAL RAILROAD COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1926, with statements showing the income account for the year and the financial condition of the company.

The Year's Business

During 1926 the company moved 33,181,573 tons of revenue freight, an increase over 1925 of 2,127,940 tons. The more important increases were: coal and coke, 1,151,024 tons; automobiles and auto trucks, 181,774 tons; and clay, gravel, sand and stone, 778,064 tons.

Revenue passengers carried were 4,275,514, a decrease compared with 1925 of 215,306, chiefly in local and commutation passengers. Revenue from passenger traffic increased, however, because of the longer average passenger haul, which was 145.52 miles in 1926 as compared with 133.71 miles in 1925.

Income Account for the Year

	Year ended Dec. 31, 1926	Year ended Dec. 31, 1925	Increase or Decrease
OPERATING INCOME	1,855.98 *miles* *operated*	1,871.32 *miles* *operated*	15.34 *miles*
RAILWAY OPERATIONS			
Railway operating revenues	$95,524,343.34	$91,864,377.45	$3,659,965.89
Railway operating expenses	64,957,363.74	61,893,039.01	3,064,324.73
NET REVENUE FROM RAILWAY OPERATIONS	$30,566,979.60	$29,971,338.44	$595,641.16
Percentage of expenses to revenues	(68.00)	(67.37)	(.63)
Railway tax accruals	$5,979,584.60	$5,864,589.76	$114,994.84
Uncollectible railway revenues	24,747.55	26,187.23	—1,439.68
RAILWAY OPERATING INCOME	$24,562,647.45	$24,080,561.45	$482,086.00
Equipment rents, net debit	$424,049.34	$227,069.76*	$651,119.10
Joint facility rents, net debit	573,467.62	543,650.02	29,817.60
NET RAILWAY OPERATING INCOME	$23,565,130.49	$23,763,981.19	—$198,850.70
MISCELLANEOUS OPERATIONS			
Revenues	$366,054.63	$385,183.94	—$19,129.31
Expenses and taxes	324,821.23	341,518.59	—16,697.36
MISCELLANEOUS OPERATING INCOME	$41,233.40	$43,665.35	—$2,431.95
TOTAL OPERATING INCOME	$23,606,363.89	$23,807,646.54	—$201,282.65
NON-OPERATING INCOME			
Income from lease of road	$10.00	$10.00	.....
Miscellaneous rent income	178,442.67	191,038.35	—$12,595.68
Miscellaneous non-operating physical property	81,757.69	81,544.38	213.31
Dividend income	571,148.01	553,861.31	17,286.70
Income from funded securities	451,036.87	118,830.33	332,206.54
Income from unfunded securities and acounts	431,687.65	500,941.42	—69,253.77
Miscellaneous income	8,068.90	39,115.01	—31,046.11
TOTAL NON-OPERATING INCOME	$1,722,151.79	$1,485,340.80	$236,810.99
GROSS INCOME	$25,328,515.68	$25,292,987.34	$35,528.34
DEDUCTIONS FROM GROSS INCOME			
Rent for leased roads	$2,735,882.82	$2,735,142.31	$740.51
Miscellaneous rents	10,074.66	2,997.78	7,076.88
Miscellaneous tax accruals	21,529.19	17,455.79	4,073.40
Interest on funded debt	3,417,167.77	3,532,743.04	—115,575.27
Interest on unfunded debt	9,688.67	19,911.15	—10,222.48
Amortization of discount on funded debt	161,988.03	169,245.59	—7,257.56
Maintenance of investment organization	1,980.33	1,796.44	183.89
Miscellaneous income charges	6,305.40	7,500.85	—1,195.45
TOTAL DEDUCTIONS FROM GROSS INCOME	$6,364,616.87	$6,486,792.95	—$122,176.08
NET INCOME	$18,963,898.81	$18,806,194.39	$157,704.42
DISPOSITION OF NET INCOME			
Dividends declared: 35 per cent in 1926; 27½ per cent in 1925	$6,557,740.00	$5,152,510.00	$1,405,230.00
SURPLUS FOR THE YEAR CARRIED TO PROFIT AND LOSS	$12,406,158.81	$13,653,684.39	—$1,247,525.58

*Credit balance in 1925

Profit and Loss Account

BALANCE TO CREDIT OF PROFIT AND LOSS, DECEMBER 31, 1925		$70,446,174.05
ADDITIONS:		
Surplus for the year 1926	$12,406,158.81	
Unrefundable overcharges	8,849.42	
Profit on property sold	40,484.30	12,455,492.53
		$82,901,666.58
DEDUCTIONS:		
Depreciation prior to July 1, 1907, on equipment retired during the year	$151,302.35	
Road property abandoned and not replaced	366,028.09	
Writing off sundry stocks which have become worthless	15,002.00	
Various miscellaneous items (net)	10,719.40	543,051.84
BALANCE TO CREDIT OF PROFIT AND LOSS, DECEMBER 31, 1926		$82,358,614.74

Operating Revenues

The total operating revenues were $95,524,343,34, an increase of $3,659,965.89.

Freight revenue was $64,489,761.55, an increase of $2,630,650.32.

Passenger revenue was $21,537,939.32, an increase of $697,-297.43.

Mail revenue was $947,085.40, a decrease of $11,562.47.

Express revenue was $4,443,370.96, an increase of $116,170.22, the result of the larger volume of business handled.

Other transportation revenues increased $18,566.78.

Incidental and joint facility revenues increased $208,843.61, to which the dining car service and demurrage contributed substantially.

Operating Expenses

The following table shows the operating expenses by groups:

Group	Amount	Increase
Maintenance of way and structures	$11,528,183.00	$1,112,595.00
Maintenance of equipment	18,064,539.71	446,398.85
Traffic	1,368,268.31	61,927.09
Transportation	29,900,804.41	681,657.79
Miscellaneous	1,142,608.84	117,775.15
General	3,082,427.35	683,126.37
Transportation for investment—credit	129,467.88	39,155.52*
Total	$64,957,363.74	$3,064,324.73

*Decrease

The increased expense for maintenance of way and structures was the result of the application of more new rail and more ballast than in 1925, and to charges incident to the remodelling of the Third Street freight terminal at Detroit.

Locomotive repairs largely accounted for the increased expenses for maintenance of equipment.

While transportation expenses increased as the result of the larger volume of traffic, the ratio of transportation expenses to operating revenues, 31.3 per cent, was 0.51 per cent lower.

Net Income Before Dividends

The net income of the company was $18,963,898.81, an increase of $157,704.42.

Changes in Funded Debt

The changes in the funded debt of the company, in detail, were as follows:

The funded debt outstanding on December 31, 1925, was $76,113,077.50

It has been increased as follows:

N Y C Lines Equipment Trust 4½ per cent certificates of May 15, 1925	1,568,000.00
	$77,681,077.50

and has been reduced as follows:

Payments falling due during the year and on January 1, 1927, on the company's liability for principal installments under equipment trust agreements as follows:		
N Y C Lines Trust of 1912, January 1, 1927	$151,710.90	
N Y C Lines Trust of 1913, January 1, 1927	262,359.54	
M C R R Trust of 1915, October 1, 1926	300,000.00	
M C R R Trust of 1917, March 1, 1926	600,000.00	
Trust No. 48 (1920), January 15, 1926	346,400.00	
M C R R Co proportion of N Y C R R Co Trust of 1920, April 15, 1926	467,664.75	
N Y C Lines Trust of 1922, June 1, 1926	373,000.00	
N Y C Lines 4½ per cent Trust of 1922, September 1, 1926	51,000.00	
N Y C Lines Trust of 1923, June 1, 1926	632,000.00	
N Y C Lines Trust of 1924, June 1, 1926	233,000.00	
N Y C Lines 4½ per cent Trust of 1924, September 15, 1926	173,000.00	
N Y C Lines 4½ per cent Trust of May 15, 1925, May 15, 1926	122,000.00	3,712,135.19
Leaving the funded debt on December 31, 1926 a net decrease of $2,144,135.19.		$73,968,942.31

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Dividends

Dividends declared and charged against the income of the year were as follows:

Date declared	Date payable	Rate per cent	Amount
June 9, 1926	July 29, 1926	17½	$3,278,870.00
December 15, 1926	January 29, 1927	17½	3,278,870.00
Total for the year, 35 per cent			$6,557,740.00

Property Investment Accounts

Increases in the property investment accounts for the year, as shown in detail elsewhere in this report, were as follows:

Road	$2,470,914.59
Equipment	4,195,686.60
Improvements on leased railway property	76,305.41
Miscellanecus physical property	2,168,321.63
Total	$8,911,228.23

Automatic Train Control

An auto-manual train stop system was installed and placed in operation on 191 miles of double main track between Detroit and Niles during the year. One hundred and ninety-seven locomotives have been equipped with the train control device.

Between Jackson and Rives Junction 10 miles of double track were equipped with automatic train control.

When the authorized installation of train control appliances between Niles, Michigan, and Kensington, Illinois, shall have been completed, the entire main line between Detroit and Chicago will be equipped with automatic train control.

Proposed Lease of the Company's Properties to The New York Central Railroad Company

The Board of Directors, by resolutions adopted on June 9, 1926, authorized, subject to approval by the holders of two-thirds of the capital stock of the company and by the Interstate Commerce Commission, the lease by the company to The New York Central Railroad Company of its lines of railroad, franchises and properties for a term of ninety-nine years, such lease to include an assignment to the lessee of the company's leaseholds of lines of other companies.

Stocks, bonds and other securities and investments of the company are, by the terms of the proposed lease, to be transferred for the duration thereof to the lessee, which is to receive the income therefrom. The lessee is to take over the company's current assets and collect moneys due the company from transactions prior to the effective date of the lease. The lessee agrees to pay the company's current and deferred liabilities, using for that purpose the current assets, or proceeds thereof, and other moneys of the company transferred to it, any excess of such current assets and moneys of the company over the amount of its said liabilities, or vice-versa, to be accounted for by the one party to the other, as the case may be, at the termination of the lease.

Under the terms of the proposed lease the lessee is to pay, as rentals, in addition to the expense of maintaining the company's corporate organization and its fixed charges and taxes, $50 per annum on each share of the capital stock of the lessor not owned by the lessee, such payment to be made direct to the stockholder.

By the terms of the proposed lease the lessee agrees to purchase any or all shares of the lessor's capital stock not owned by the lessee at its fair value,—to be agreed upon or determined by arbitration,—if offered for such purchase within ninety days after notice to holders of the execution of the lease, which notice is required to be given by the lessee within sixty days after the making of such lease.

The proposed lease contains appropriate provisions for the payment or refunding of the company's bonds and other obligations maturing during the term of the lease, for the issue by the company of its bonds or other securities to reimburse the lessee for the cost of additions and betterments and equipment to be made or acquired for account of the company, for return of the company's properties at the termination of the lease in a proper state of repair with proper accounting for retirements of property, for modifications with the approval of the Board of Directors, for arbitration of differences, etc.

Application has been filed by The New York Central Railroad Company with the Interstate Commerce Commission for its approval of the proposed lease. The required approval of the stockholders was given on November 4, 1926, at a special meeting called to consider the lease.

Among the securities to be transferred by the company to the lessee under and for the duration of the proposed lease are 2,700 shares of the capital stock of Chicago, Kalamazoo and Saginaw Railway Company. It is proposed that that company, also, shall make a ninety-nine year lease of its properties to The New York Central Railroad Company, which owns the remaining 1,800 shares of its outstanding stock.

The Board wishes to express its appreciation of the loyal and efficient service of the offices and employees of the company during the year.

For the Board of Directors,
P. E. CROWLEY,
President.

[ADVERTISEMENT]

Railway Finance

(*Continued from page 2027*)

the Northern companies and of the Spokane, Portland & Seattle and from any other properties not acquired by the new company through the use of its own credit, in proportions based upon the principle of the equality of value of one share of stock of one Northern company to one share of stock of the other.

"In other respects the leases differ but little from the forms customary in similar situations. They contemplate the transfer to the new company for a term of ninety-nine years of substantially all of the properties of each of the Northern companies. Corporate books are excepted from the leased properties, and in a few cases where the property is to be reduced to cash, such property is excluded with a provision for transfer of the proceeds when received. All lines of railroad and appurtenances, equipment, easements, trackage and terminal rights and other operating contracts are transferred, together with all title and interest in all bonds, notes and shares of stock, including the respective companies' interests in the stock of the Burlington and in the stock and bonds of the Spokane, Portland & Seattle. All dividends of stock and interest on bonds and notes go to the new company during the term of the leases.

"Current assets and cash are also transferred against the lessee's obligation to pay all current liabilities existing at the effective date of the leases, with a provision for accounting at the termination of the leases for any difference one way or the other. The leases contemplate the operation of the properties of the two Northern companies and of the Spokane, Portland & Seattle as a unified whole with complete discretion in the new company as to operating and financial policies and the making of additions, betterments and extensions to road and equipment. The provision for accounting as to surplus is so drawn as to leave the use and disposition of the surplus earnings during the term of the leases in the control of the new company, subject only to the duty to account on the termination of the leases."

PERE MARQUETTE.—*Stock Dividend.*—This company has applied to the Interstate Commerce Commission for authority to issue $9,009,200 of additional common stock as a stock dividend, capitalizing approximately half of the company's surplus.—*Equipment Trust.*—The company has also applied to the commission for authority for an issue of $2,550,000 of equipment trust certificates, to be sold to the highest bidder.

PITTSBURGH, SHAWMUT & NORTHERN.—*Receiver's Certificates.*—The receiver has applied to the Interstate Commerce Commission for authority to issue $2,044,350 of receiver's certificates, to retire outstanding certificates by paying 5 per cent in cash and 95 per cent in new certificates, and to issue a promissory note for $322,000 to renew a note due June 2, 1927.

SOUTHERN PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized the issue of $20,000,000 of Oregon lines first mortgage bonds, to be sold at not less than 98.

UNION PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $28,835,000 of 40-year 4½ per cent bonds to be sold at not less than 94¾.

WASHINGTON TERMINAL. — *Tentative Valuation.* — The Interstate Commerce Commission has made public its tentative valuation of the Washington (D. C.) Terminal Company, finding the final value for rate-making purposes of the property both owned and used for common carrier purposes to be $11,525,000 as of June 30, 1915. The value of the total owned property was placed at $12,016,731, but property valued at $491,731 was leased to railroads and express companies. The company had an outstanding capitalization as of valuation date of $16,252,000. The original cost valuation to date of the common-carrier property, according to the report, was approximately $12,336,009, comprising approximately $15,298,839 of recorded money outlay, less $3,000,000 contributed by the United States government, plus $37,170 of discount on funded debt applicable to the construction period.

WESTERN MARYLAND. — *Acquisition.* — This company has applied to the Interstate Commerce Commission for authority to acquire control of the Greenbrier, Cheat & Elk, a short line connecting with its line at Cheat Junction, W. Va., by lease and by purchase of its capital stock, the consideration being its assumption of liability for $1,585,000 of first mortgage 5 per cent bonds which the short line asked authority to issue. The stock is owned by the West Virginia Pulp & Paper Company. The commission has made public a report proposed by Examiner Thomas F. Sullivan recommending a finding by the commission that the acquisition by the Western Maryland of the Chesapeake & Curtis Bay by purchase of its stock for $325,000 would not be in the public interest.

Average Price of Stocks and Bonds

	June 21	Last week	Last year
Average price of 20 representative railway stocks..	114.10	112.61	95.89
Average price of 20 representative railway bonds..	93.76	93.67	91.43

Valuation Reports

The Interstate Commerce Commission has issued tentative valuation reports stating the final value for rate-making purposes of the property owned and used for common-carrier purposes, as of the respective valuation dates, as follows:

Tentative Reports

Butte, Anaconda & Pacific	$7,070,000	1920
Middletown & Unionville	102,000	1916
Washington Terminal	11,525,000	1915
Chicago, West Pullman & Southern	461,418	1919
Maryland & Pennsylvania	3,072,500	1918
Lake Terminal	2,006,458	1919

Dividends Declared

Boston & Maine.—7 per cent cumulative prior preference, 3½ per cent, semi-annually; first preferred A, 2½ per cent, semi-annually; first preferred B, 4 per cent, semi-annually; first preferred C, 3½ per cent, semi-annually; first preferred D, 5 per cent, semi-annually; first preferred E, 2¼ per cent, semi-annually, all payable July 1 to holders of record June 21.

Canada Southern.—1¼ per cent, semi-annually, payable August 1 to holders of record July 1.

Cincinnati Northern.—5 per cent, semi-annually, payable July 20 to holders of record July 13.

Cleveland, Cincinnati, Chicago & St. Louis.—Common, $2.00, quarterly; preferred, 1¼ per cent, quarterly, both payable July 20 to holders of record July 1.

Kansas City Southern.—Preferred, 1 per cent, quarterly, payable July 15 to holders of record June 30.

Lake Erie & Eastern.—2 per cent, payable July 1 to holders of record June 24.

Louisville & Nashville.—$3.50, semi-annually, payable August 10 to holders of record July 15.

Mahoning Coal Railroad.—Common, $12.50, quarterly, payable August 1 to holders of record July 15. Preferred, $1.25, quarterly, payable July 1 to holders of record June 25.

Michigan Central.—$20.00, semi-annually, payable July 29 to holders of record July 1.

Missouri-Kansas-Texas.—Preferred A, $1.50, quarterly, payable August 1 to holders of record July 15.

New York Central Railroad.—2 per cent, quarterly, payable August 1 to holders of record July 1.

Northern Railroad of New Hampshire.—1½ per cent, quarterly, payable July 1 to holders of record June 13.

Norwich & Worcester.—Preferred, 2 per cent, quarterly, payable July 1 to holders of record June 11.

Old Colony Railroad.—1¾ per cent, quarterly, payable July 1 to holders of record June 11.

Pittsburgh & Lake Erie.—$2.50, semi-annually, payable August 1 to holders of record July 1.

Providence & Worcester.—2½ per cent, quarterly, payable June 30 to holders of record June 8.

Seaboard Air Line.—Semi-annual interest of 2½ per cent on adjustment income bonds, payable August 1.

Toronto, Hamilton & Buffalo.—3 per cent, semi-annually, payable July 1 to holders of record June 27.

Virginian Railway.—Preferred, $3.00, semi-annually, payable August 1 to holders of record July 23.

CHROME NICKEL STEEL IN SPECIAL TRACK WORK.—A scientific and practical discussion of the characteristics of chrome nickel steel adaptable for use in equipment subject to unavoidable abuse and hard wear, is contained in Bulletin No. 10 issued by the International Nickel Company, 67 Wall street, New York. The results of more than six years' use by the Milwaukee Electric Railway and Light Company also are given in this eight-page bulletin.

Railway Officers

Financial, Legal and Accounting

Bertram Quelch, assistant auditor of passenger receipts of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed auditor of passenger receipts, with the same headquarters, succeeding **George S. Le Grand,** deceased. **W. S. Ledbetter** has been appointed auditor of construction.

Operating

J. M. Raine has been appointed assistant superintendent of the Sewell Valley sub-division of the Chesapeake & Ohio, with headquarters at Rainelle, W. Va.

Clarence A. Ott, conductor on the Marion division of the Erie, has been promoted to assistant trainmaster of the second district of that division, with headquarters at Huntington, Ind.

W. C. Higginbottom, who has been promoted to general superintendent of transportation of the Western region of the Pennsylvania with headquarters at Chicago, was born on May 14, 1880, in Stark county, Ohio. He entered railway service at the age of 15 as a telegraph operator on the Eastern division, being advanced to chief dispatcher's clerk in August, 1907. Mr. Higginbottom then served successively on the Pennsylvania as train dispatcher and assistant trainmaster. On October 1, 1918, he was promoted to trainmaster, becoming freight trainmaster on the Pittsburgh terminal on March 1, 1920, where he remained until November 28 of the same year when he was again promoted to assistant superintendent of the Pittsburgh division. He was further advanced to superintendent of the Peoria division on November 16, 1921, being transferred to the Richmond and Panhandle divisions and finally to the Philadelphia division, with headquarters at Harrisburg, Pa., before his appointment as general superintendent of transportation of the Western Region.

W. C. Higginbottom

W. C. Beck, assistant superintendent on the Quebec district of the Canadian Pacific, with headquarters at Ottawa, Ont., has been transferred to the Brownsville division of the New Brunswick district, with headquarters at Brownsville Junction, Me.

Stroad P. Henderson, who has been promoted to general superintendent of the Chicago & Alton, with headquarters at Bloomington, Ill., was born on September 11, 1874, at Rolling Prairie, Ind., and after attending high school at Monticello, Ind., entered railway service in October, 1891, as a telegraph operator on the Louisville, New Albany & Chicago (now the Chicago, Indianapolis & Louisville) at Monticello. From June, 1893, to October, 1899, he acted in the same capacity and as a train dispatcher on the Chicago, Rock Island & Pacific at Rock Island, Ill., and then became a train dispatcher on the Delaware, Lackawanna & Western at Hoboken, N. J. In September, 1902, Mr. Henderson became a dispatcher for the Chicago, Cincinnati & Louisville (now a part of the Chesapeake & Ohio), later serving this railroad as chief dispatcher and trainmaster at Peru, Ind., where he remained until February, 1905, when he was appointed superintendent on the Buffalo & Susquehanna at Galeton, Pa. From February, 1908, to August, 1910, he acted as trainmaster on the Kansas City Southern at Mena, Ark., and for the following two years he was trainmaster on the Alton at Bloomington. Mr. Henderson was promoted to superintendent of the Northern division of the Alton in October, 1912, a position he held continuously until his further promotion to general superintendent on May 1.

Traffic

F. A. Layman has been appointed district freight agent of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa.

A. S. Rosenbaum, district freight and passenger agent on the Southern Pacific at Medford, Ore., has been promoted to general agent, with headquarters at the same point.

George Stephen, assistant freight traffic manager of the Canadian Pacific and freight traffic manager of the Kettle Valley, with headquarters at Winnipeg, Man., has been appointed freight traffic manager of the Canadian Pacific, with headquarters at Montreal, Que., effective July 1, succeeding **E. N. Todd,** resigned.

M. J. Costello, western traffic manager, **C. W. Meldrum,** assistant general passenger agent, and **A. J. Grummett** and **B. S. Merritt,** assistant general freight agents, of the Great Northern, all with headquarters at Seattle, Wash., have been in addition appointed in corresponding capacities for the Spokane, Coeur D'Alene & Palouse.

Wins F. Wilson, who has been appointed general freight agent and assistant secretary of the Southern, with headquarters at Richmond, Va., was born on March 9, 1876, at New Orleans, La., and was graduated from the public schools of Richmond. He attended Richmond College (now the University of Richmond) for two years, leaving in June, 1895. He entered railway service on May 5, 1897, with the Southern, as a stenographer in the general freight office. On April 1, 1902, he became soliciting agent at Richmond. During 1904 he served for nine months as chief clerk in the general freight agent's office at Richmond. Mr. Wilson was appointed commercial agent at Richmond on June 1, 1910, and assistant general freight agent there on January 18, 1917, which position he was holding at the time of his recent appointment as general freight agent and assistant secretary.

F. S. Howard, who has been appointed assistant passenger traffic manager of the Southern Pacific, with headquarters at San Francisco, Cal., was born on June 5, 1876, at Baldwinsville, N. Y., and attended Leland Stanford University. He entered railway service with the Southern Pacific on March, 1900, holding various minor positions in the traffic department until his promotion to chief rate clerk and his further promotion to assistant general passenger agent, with headquarters at San Fran-

F. S. Howard

cisco, on December 1, 1923. Mr. Howard was advanced to assistant to the passenger traffic manager at San Francisco on July 1, 1925, a position he held until his promotion to assistant passenger traffic manager on May 1.

George F. Knight, division freight agent on the Chicago & Eastern Illinois at Danville, Ill., has been appointed general agent of the Wisconsin territory, with headquarters at Milwaukee, Wis., succeeding **R. L. Gainer,** transferred to Detroit, Mich. Mr. Gainer replaces **J. D. Sneed** who has been appointed division freight agent at Danville. **C. R. Jones** has been appointed general agent in the New Orleans territory with headquarters at New Orleans, La.

John E. Buckingham, general freight and passenger agent of the Colorado & Southern, with headquarters at Denver, Colo., has been promoted to traffic manager with headquarters at the same point, succeeding **H. A. Johnson,** who retired on June 1 at the age of 73 years.

J. E. Buckingham

Mr. Buckingham was born on November 21, 1871, at St. Joseph, Mo. He entered railway service as a stenographer on the Chicago, Burlington & Quincy in 1887. Mr. Buckingham was then advanced successively on the Burlington to rate clerk, chief clerk, assistant general passenger agent of the lines west of the Missouri river, with headquarters at Omaha, Neb., and general baggage agent at Chicago. During the period of federal control of the railroads he served in the traffic department of the United States Food Administration and with the United States Railroad Administration. On March 1, 1920, Mr. Buckingham returned to the Burlington as general baggage agent at Chicago and on August 1 of the same year he was appointed assistant general freight and passenger agent of the C. & S., with headquarters at Denver. Mr. Buckingham was promoted to general freight and passenger agent in 1925, a position he held until his further promotion to traffic manager on June 1. Mr. Johnson who is retiring as traffic manager was born on January 12, 1854, at New York. He enterer railway service on July 11, 1871, as an office boy in the general freight office of the Missouri Pacific, serving this company until January 1, 1886, successively as clerk, traveling freight agent, contracting agent, chief clerk in the general freight office, assistant general freight agent and commercial agent at Chicago and later at Atchison, Kan. Mr. Johnson then became assistant general freight agent on the Union Pacific and after a year as general freight agent of the Kansas City, Ft. Scoot & Memphis (now a part of the St. Louis-San Francisco) he returned to the Union Pacific as assistant general freight agent at Denver on January 1, 1890. Until February 1, 1899, when he entered the service of the C. & S. as general freight agent, Mr. Johnson was traveling freight agent of the Great Northern at Spokane, Wash., division freight and passenger agent on the same railroad at Seattle, Wash., and general agent in the freight department of the Union Pacific. On March 1, 1915, he was appointed general freight and passenger agent, becoming traffic manager on October 12, 1915, a position he held continuously until his retirement on June 1.

C. E. Muller, assistant freight traffic manager of the Seaboard Air Line, with headquarters at Jacksonville, Fla., has been temporarily transferred to Norfolk, Va. **E. J. Parrish,** assistant general freight agent, with headquarters at Savannah, Ga., has been appointed assistant freight traffic manager at Jacksonville, Fla., with jurisdiction over all freight traffic matters in Jacksonville territory and solicitation, service, and kindred matters (excepting industrial development, leases, etc.) in Florida. **R. W. Daniel,** assistant general freight agent at Tampa, Fla., has been transferred to Savannah, Ga. **J. W. Booth,** assistant general freight agent at Tampa, will assume charge of reassigned Tampa territory. **F. G. Roberts** has been appointed assistant general freight agent at Miami, Fla., in charge of Miami territory. **E. P. Mills** has been appointed division freight agent at Jacksonville. All appointments and transfers are effective July 1.

Mechanical

C. F. Morrett, assistant trainmaster of the second district of the Marion division of the Erie, with headquarters at Huntington, Ind., has been appointed supervisor of locomotive operation on that division, with headquarters at the same point. **G. E. Lund,** master mechanic, with headquarters at Huntington, has been appointed assistant superintendent of the car department, with headquarters at Huntington.

Robert P. Blake, master mechanic of the Montana division of the Northern Pacific, with headquarters at Livingston, Mont., has been transferred to the St. Paul division, with headquarters at St. Paul, Minn., succeeding **J. B. Neish,** granted a leave of absence. **Edmund H. Carlson,** assistant master mechanic on the Fargo division, with headquarters at Staples, Minn., has been appointed acting master mechanic of the Montana division, succeeding Mr. Blake. **Ralph E. Hammond** has been appointed assisted assistant master mechanic of the Fargo division, succeeding Mr. Carlson.

Engineering, Maintenance of Way and Signaling

H. D. Tubbs has been appointed resident engineer in charge of yard construction and grade revision on the Pere Marquette at McGrew, Mich., succeeding Frank Manning, who has been promoted to assistant division engineer, with headquarters at Grand Rapids, Mich.

T. A. Youngblood, assistant division engineer of the International-Great Northern at Houston, Tex., has been appointed assistant engineer of the Houston Belt & Terminal, with headquarters at the same point, succeeding **H. E. Stuckert,** appointed division engineer of the Houston North Shore, all subsidiaries of the Missouri Pacific.

Purchases and Stores

Eugene Decker, who has been appointed purchasing agent of the Maine Central, with headquarters at Portland, Me., was born on December 18, 1876, at Clinton, Me., and was graduated from Shaw's Business College, Portland, in 1893. He entered railway service on June 26, 1893, with the Maine

Eugene Decker

Central as operator at Thompson's Point. Mr. Decker was transferred to the Portland freight office on August 16, 1903, and was appointed chief clerk to the purchasing agent on March 3, 1913, which position he was holding at the time of his recent appointment as purchasing agent.

Obituary

William H. Richmond, master mechanic of the Lake Superior & Ishpeming from 1899 to 1919, died at Marquette, Mich., on June 13, aged 77 years.

Lee R. Jones, general agent for the Missouri Pacific at Mexico at Mexico City, Mex., died at his home in that city on June 18. Mr. Jones had been stationed at Monterrey, Mexico, since 1921 as commercial agent and at Mexico City as general agent since October, 1926.

Robert Irving, who was president of the Kaslo & Slocan (merged with the Kootenay Railway & Navigation Company and now part of the Great Northern) from 1899 to 1905, died on June 10 at his home in Vancouver, B. C. Mr. Irving was born in 1849 at Ingersoll, Ont. His first occupation in the West was that of purser on a steamer on the Fraser river, between New Westminster, B. C., and Yale. His first railroad service began in 1888 when he was appointed agent on the Canadian Pacific at Victoria, B. C. In 1896, Mr. Irving was elected secretary, auditor and traffic manager of the Kaslo & Slocan, with headquarters at Kaslo, B. C., becoming president and traffic manager in 1899. Since 1905 Mr. Irving had held interests in mining properties in British Columbia.

Edward H. Blossom, at one time assistant superintendent of the St. Johnsbury & Lake Champlain (now part of the Boston & Maine) and general manager of the Hardwick & Woodbury, died on June 19 at Macon, Ga. Mr. Blossom was born on June 16, 1852, at Compton, Que., and entered railway service in 1877, serving until 1881 as assistant station agent on the Boston, Concord & Montreal (now also a part of the Boston & Maine) at Whitefield, N. H. From 1881 until 1884, he served as agent for the same road at Fabyan's, N. H., and from 1885 until 1889, was trainmaster on the St. Johnsbury & Lake Champlain. From 1889 until about 1901, Mr. Blossom served as assistant superintendent of the same road. In 1895, Mr. Blossom built the Hardwick & Woodbury Railroad, and became general manager. He retained this position until 1902.

Frank Blair Brown, general auditor of the Cincinnati, Indianapolis & Western, who died on May 6, was born on July 2, 1862, at Toledo, Ohio, and attended the Toledo High school. Mr. Brown entered railway service in April, 1877, as a messenger boy on the Wabash at Toledo, later being advanced to a clerk. In 1885, he became a general office clerk on the Toledo, St. Louis & Kansas City at East St. Louis, Ill., and until 1890 he also served with this company as a traveling auditor and agent. For a short time during 1891 he acted as agent for the Cincinnati, Jackson & Mackinaw at Toledo and in the following year he was appointed traveling auditor of the Wheeling & Lake Erie. During the period until June 1, 1908, Mr. Brown served as traveling auditor and as auditor of freight and ticket accounts and he was then appointed auditor on the Wabash, Pittsburgh Terminal. He returned to the W. & L. E. as auditor on June 1, 1921, where he remained until December 1, 1915, when he was appointed auditor of the C. I. & W. During Federal control of the railroads Mr. Brown was appointed general auditor of the C. I. & W., remaining in that position upon the return of the railroads to private control and retaining it until the time of his death.

Judge James H. Reed, president of the Bessemer & Lake Erie, with headquarters at Pittsburgh, Pa., died on June 17, at his home in Pittsburgh. He was born on September 10, 1853, at Allegheny City, Pa., and was educated at the Western University of Pennsylvania (now University of Pittsburgh). He entered railway service in May, 1881, as assistant general solicitor of the

J. H. Reed

Pittsburgh & Lake Erie. In 1891-92 he was United States District Judge for the Western district of Pennsylvania. For many years he served as vice-president and general counsel of that road and on May 1, 1896, became president of the Pittsburgh, Bessemer & Lake Erie and its successor the Bessemer & Lake Erie. Since May 1, 1896, he has also been president of the Union Railroad.

Charles A. Vermillion, assistant to the president of the Spokane, Portland & Seattle, with headquarters at Portland, Ore., died at St. Vincent's hospital in that city from heart disease on June 14. Mr. Vermillion was born on October 20, 1860, at St. Louis, Mo. He attended St. Louis University from 1872 to 1876 and immediately thereafter entered railway service as a messenger in the master mechanic's office on the Missouri Pacific at St. Louis. From November 1, 1877, to December 5, 1902, Mr. Vermillion served successively as operator and station agent, dispatcher, clerk to the master of transportation and chief dispatcher on the Missouri Pacific and subsidiaries and he was then promoted to division superintendent of the Missouri Pacific at Atchison, Kan. He left the Missouri Pacific in 1909 to become trainmaster on the S. P. & S. at Vancouver, Wash., where he remained until 1912 when he was appointed superintendent of car service and telegraph of the Oregon Electric, the S. P. & S., the Oregon Trunk and the United Railways. During 1917 Mr. Vermillion acted as superintendent of the S. P. & S., and the three railroads which are now subsidiaries of it, with headquarters at Portland. In 1920 he was appointed assistant to the president of the S. P. & S., a position he held until the time of his death.

Two Sections—Section Two

Railway Age

Motor Transport Section

Devoted to the Co-ordination of Railway and Highway Service

FIRST HALF OF 1927—No. 30 NEW YORK—JUNE 25, 1927 - CHICAGO SEVENTY-SECOND YEAR

Tractor and Trailer Used by the Rock Island for l. c. l. Freight Handling in Chicago

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Articles in This Issue:

Maintenance of N. E. T. Buses at the Providence Garage

Trucks, Tractors and Trailers Widely Used

Chicago Tunnel Company Adopts Store-Door Delivery

Railroads again turn to Westinghouse

FROM coast to coast, railroads are supplementing present rail lines, connecting service points, and tapping virgin territory, with modern Air Braked Coaches.

These railroads were quick to realize the advantages of the Automotive Air Brake and have turned to Westinghouse for the solution of safety and economy problems in modern highway transportation. Westinghouse Air Brakes have proven themselves, not merely a potent factor of Safety, but also one of solid economy. With them, larger coaches of greater passenger carrying capacity can be operated at faster schedule speeds, which means more fares, more trips, and consequently increased earnings.

The foremost automotive manufacturers have reflected their confidence in the advantages of the Westinghouse Automotive Air Brake by accepting it, as standard factory equipment, on their modern motor coaches.

WESTINGHOUSE AIR BRAKE COMPANY
Automotive Division, Wilmerding, Pa.

WESTINGHOUSE
AUTOMOTIVE AIR BRAKES

6181

Railway Age
Motor Transport Section
Devoted to the Co-ordination of Railway and Highway Service
Vol. 82 June 25, 1927 No. 30

Co-ordinated Transportation on the Boston & Maine

Contents

N. E. T. Maintenance Activities Center at New Providence Garage ..... Page 2035

Part I of a two-part article giving details of maintenance practice of largest railroad bus operator and describing modern facilities provided in new garage and shop.

Trucks, Tractors and Trailers Widely Used 2039

An editorial survey of the railroads shows steady increase in use of motor vehicles to produce economies and give greater efficiency in freight service.

The Bus on the Short Line Railroad 2043

The Middletown & Unionville finds that bus service takes adequate care of patrons and speeds up freight service by reducing passenger train interference.

EDITORIALS:

A High Standard of Personal Service 2033
Steady Expansion in Operation of Motor Trucks 2033
On the Short Line 2033
The Oregon Law 2033
Widespread Railway Bus Operation Predicted 2034
Wanted, a Standard Formula 2034
A Well-Organized Shop 2034

GENERAL ARTICLES:

N. E. T. Maintenance Activities Center at New Providence Garage, Part I 2035
Improvements Made in Six-Wheel Bus Chassis 2038

GENERAL ARTICLES—Continued

Trucks, Tractors and Trailers Widely Used 2039
Redesigned Engine for Graham Trucks 2042
A Tool for Centering Piston Heads in a Lathe or Grinder 2042
The Bus on a Short Line Railroad 2043
The Oregon Bus and Truck Law 2045
Tire Purchase vs. Tire Rental 2047
The Liability of Motor Truck Carriers 2048
Chicago Tunnel Company Adopts Store Door Delivery 2049
S. A. L. Makes Its First Application for Bus Permit 2050
A Communication from F. J. Scarr 2050
Bus Experts Discuss Rail-Highway Co-ordination 2051
Motor Transport News 2055

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TRUCKS

Cooperate with Unit Container Operation

Mack truck equipped for transfer of "L. C. L." Co. general freight containers on the New York Central Lines. (Trucks operated by Motor Truck Renting Co.)

Special body, built to transport 2 full L. C. L. container-loads of brick (6000).

Extensive operation of L. C. L. brick containers at Melrose Yards—New York Central Lines.

Great credit is due the "L.C.L." Co. and the New York Central R.R. for pioneer development and for perfecting of containers, railway equipment and cranes for the transfer of containers from railway to highway units.

Railway Age
Motor Transport Section
Devoted to the Co-ordination of Railway and Highway Service

Vol. 82, No. 30 June 25, 1927

Table of Contents Appears on Page 69 of the Advertising Section

A High Standard of Personal Service

A PERSONAL touch in the service rendered has been a chief reason for the popularity of the form of travel offered by bus lines. Full credit must be given the pioneers who have been responsible for this popularization of bus travel. Buses, because of their small size and the fact that they are not confined to a pair of rails, offer opportunity for rendering service of a personal nature that railway trains do not. Most bus companies have taken advantage of this opportunity. "Service" is a much over-worked term which too often means little. Many bus lines have made it mean something, however, with the result that to a great many people, bus transportation means something more than merely transportation. Many railway motor bus lines are competing with independent lines. They can provide better buses and more frequent service, and offer greater assurance of responsibility in case of accident, but success in the contest for patronage will not be certain unless the railway buses afford the same kind of friendly, personal transportation service as the independents.

Steady Expansion in Operation of Motor Trucks

THE motor truck, the tractor and the trailer are steadily playing a greater part in the operations of the railways. A survey of the Class I railways, completed recently by the *Railway Age*, has developed a number of interesting facts indicating this. An article on the results of this survey is contained in this issue of the Motor Transport Section. The number of Class I railways operating motor trucks, tractors and trailers for the transportation of freight is now 24. The number of trucks that they use is approximately 1,597, the number of tractors, 54; and the number of trailers, 225. The transportation of freight within terminals is handled with motor trucks by 19 of the 24 roads, while 13 use trucks in line service and 8 in both terminal and line service. Briefly, motor trucks are being used by railways to replace way-freight local trains, to supplement train service, to provide store-door delivery, to replace trap cars, to replace lighterage, to make transfers between freight stations of different lines within terminals, and to carry mail, baggage and express supplementary to bus service in the replacement of passenger train service. In every instance the operation of motor trucks, tractors and trailers has been instituted with the intention of expediting or rendering more economical the freight transportation service offered to shippers. If the continuation and expansion of such motor vehicle operation by the 24 roads can be taken as proof, the desired results have been attained.

On the Short Line

MANY large railroads operate some passenger trains which fail by a large margin to pay their way. Unsatisfactory as this situation is, it is not, however, of necessity disastrous. Such roads may enjoy a remunerative freight business and a profitable through passenger traffic. Consequently they can absorb some losses from the short-haul, branch-line passenger trains without risking seizure by the sheriff. With the short line railroad, however, this is frequently not the case. The short line, generally, cannot afford to do any business which is not remunerative. If passenger business declines and yet the public authorities insist that it continue to provide service, prompt and thorough-going action is generally essential to bring down the costs. The short line railroads have consequently made wide use of the rail motor car and the bus. How one such line has utilized both these means of transportation to reduce its costs from $2 to 26 cents a mile without curtailing service is told in an article on page 2043 of this issue. It is sometimes rather difficult for the larger railroads to separate the earnings and expenses of their branch lines from those of the rest of the system. It is only when the branch lines are run as separate railroads, which in reality is what the short lines frequently are, that an accurate picture of branch line railroad economics can be had. The successful utilization of the motor vehicle by the short line railroad, therefore, is of real significance to the larger road with a considerable branch line mileage.

The Oregon Law

THE present Oregon law providing for the regulation of motor buses and trucks operating for hire is considered by a number of railway officers to be one of the best laws of its kind in the United States, at least from the standpoint of its regulation of competitors with railways. The provisions of this law, which was passed in 1925 and ratified by popular referendum late last year, are described in an article in this issue of the Motor Transport Section. Those parts of it with respect to the powers granted to the Public Service Commission for the regulation of the operation of bus and truck lines and for the assessment of fees to be paid by them in return for the privilege of operating for hire over the highways of Oregon, are noteworthy. The important achievement of the law is its placing of bus and truck carriers on the same basis, with respect to regulation, as rail carriers; this is a position which railway officers in general have desired. However, the law specifically regulates only the motor carriers transporting the persons or freight of the general public and seems not to include contract carriers. Many railways

have had the experience of seeing truck operators doing what is to all intents and purposes a common carrier business on a contract basis, thus evading the regulation applying to common carriers. To this extent, at least, the Oregon law seems to lack a desirable provision. It has gone far, however, along the way toward adequate regulation of motor buses and trucks.

Widespread Railway Bus Operation Predicted

THREE prominent authorities on motor transportation agreed at a meeting last week that the railways will be the principal operators of motor buses and that through such operation by them, the co-ordination of railway and highway transportation will be effected to the greatest degree. Oddly enough, these statements were made at the meeting of the Bus Division, American Automobile Association, the attendance at which was made up almost entirely, so far as bus operators were concerned, by independent operators, with perhaps a half dozen electric railway representatives. The speakers seemed to find little place in the future for the independent bus operator of today. While granting that there will doubtless be instances in which independent bus operators, acting in co-operation with railways, will continue to hold a place in the field, they plainly indicated that the interests of motor transportation, the interests of the public and the interests of the railways themselves demand that buses be adopted by the railways as auxiliaries, and none of them doubted that this would be generally done. They maintained that the established transportation companies are the only ones which can attain the ultimate goal, co-ordinated rail and highway transportation. The rapidly growing number of railways which are undertaking bus operation indicates that many railways themselves are in accord with these authorities in recognizing what is ahead.

Wanted, a Standard Formula

AT the Montreal meeting of the Mechanical Division, T. W. Demarest, general superintendent of motive power of the Western Region of the Pennsylvania, said, in discussing the report of the committee on automotive rolling stock: "I believe the committee ought to take up a uniform system of reporting costs of operation. I have tried to analyze the results of our own performance with the reports from quite a number of different railroads. I can't find any two reports that are made up on the same basis, so that when I come to the final analysis, train-mile costs, I am not at all sure that any comparison we make is representative at all. Some uniform schedule for reporting operating and maintenance costs, taking into consideration the depreciation rate you are going to charge off for equipment, should be outlined." Mr. Demarest had rail motor cars particularly in mind when he spoke. Nevertheless, his opinion applies with equal force to highway vehicles and steam trains. A uniform method of figuring costs per mile would greatly clarify the problem of determining accurately the type of service which would be the most economical in any given case. Moreover, a formula with the stamp of general approval upon it would curtail the challenging of figures of this kind when they are presented in testimony before regulatory commissions. Is it not advisable for the various divisions of the American Railway Association to co-operate in establishing such a formula? Doubtless the Railroad Motor Transport Conference, when it gets well under way, can be a real help in bringing in data on highwal vehicle costs.

A Well-Organized Shop

IN organizing an automotive transportation company as much consideration should be given the formation of an efficient mechanical department, with adequate shop facilities, as is given to the building up of an efficient transportation department. Nothing will reduce the net income more quickly than poor or deferred maintenance. The New England Transportation Company, realizing this, has built and equipped at Providence, R. I., a garage that takes care of approximately 143 coaches.

Because of the large area covered by some coach companies, it is necessary to have a number of garages at which the coaches can be put up for the night and receive minor repairs. It is essential, however, that a main garage be built at a central point to which all the equipment can be sent for periodical general overhauling. Heavy repairs can then be closely supervised and the units put back in service with reasonable assurance that the work has been correctly performed.

When considering the plans for a central repair garage, due regard should be given not only to the present requirements, but to future expansion. It is generally agreed that the operation of automotive equipment by steam railroads is here to stay and will steadily expand. The management wisely took this factor into consideration when building the Providence garage and allowed sufficient ground space to enlarge the garage one-third its present size.

Another important factor in reducing the maintenance cost per mile is to adequately equip the garage with modern machine tools and shop equipment. One steam railroad that operates a large fleet of coaches undertook to equip its garages with surplus machine tools from its locomotive shops. It was not long in realizing that it had made a serious mistake. For instance, in machining parts for an internal combustion engine it is necessary to work to very close tolerances. No matter how skilled the operator is, accurate work cannot be turned out on machine tools that have undergone hard service in a locomotive repair shop. The fact that the amount of spoiled work at the Providence garage is almost negligible can be attributed, in part at least, to the modern machine tools. The mechanical department of this company has profited from experience in the selection of its mechanics. When the garage was first opened, the personnel was largely recruited from the locomotive repair shops of the New Haven. It was found that the automotive trained mechanic lacked the discipline of the railroad mechanic, but that the latter is used to rougher work and has more leeway, for instance, in the fitting of bearings than does the automotive mechanic. Consequently, it is much more satisfactory to take men who have had a little automotive experience and train them than to take railroad mechanics and try to make automotive mechanics of them. The mechanical personnel of this company is 100 per cent automotive mechanics. Five other railroads have had the same experience with railroad mechanics and have turned to the trained automotive mechanic.

The New England Transportation Company has now reached the point where the present mechanical personnel in the backshop at Providence may be retained intact the year around, a condition that is very desirable, in the interests of efficiency and more economical operation; the employees are also more contented.

Three of the Four Electrically Operated Hoists in Use at the N. E. T. Providence Garage

N. E. T. Maintenance Activities Center at New Providence Garage

Fireproof building equipped with modern machine tools and shop equipment—Effective system of inspection and lubrication

PART I

SINCE the incorporation in the summer of 1925, of the New England Transportation Company, the bus subsidiary of the New York, New Haven & Hartford, this company has acquired 190 deluxe and semi-deluxe buses. The rapid increase in the number of bus routes, with a corresponding increase in equipment, quickly overtaxed the facilities of the mechanical department to service the buses properly. The result of the lack of adequate repair facilities was that heavy repairs were deferred.

The Supervisory Staff at the Providence Garage of the N. E. T. Co.

This condition led to the building, at Providence, R. I., of a heavy duty repair shop which has a storage capacity for 50 buses and is equipped to handle heavy overhaul work on all equipment operating in Rhode Island and east of Worcester in Massachusetts. A total of 135 buses, which cover about 350,000 miles a month, are assigned to this garage for maintenance. The present schedule calls for 60 complete overhauls at Providence for the present year, or five per month. This is based on an average of about 85,000 miles per overhaul, although the actual figure varies according to the type of bus and the character of the service it has performed.

The Construction of the Garage

The garage is located on Kinsley avenue, less than a mile from the N. E. T. passenger terminal. The garage is 300 ft. long and 150 ft. wide, which provides a floor area of about 48,000 sq. ft., all under one roof. The main bay, with side openings in the middle of the building for miscellaneous facilities, gives a single open space of about 36,000 sq. ft.

Most buildings erected for maintenance purposes are laid out to provide for extensions. The engineers responsible for the garage have not only done this by setting back the temporary wall more than 100 ft. from the street, but also have been far-sighted enough to build part of the floor of the extension in advance. This part is used as the main driveway, where the fuel tanks are filled. The extension, when built, will be 120 ft. long and 150 ft. wide, which will give the garage an ultimate storage capacity for 62 cars.

The portion set aside for heavy repairs is at the south end of the garage. Clearance between the floor and the bottom of the roof trusses is 20 ft., to permit buses to be raised on the four Columbia electric hoists. This high portion is only 100 ft. long, while the front 200 ft.

has a 16-ft. clearance. The west bay beginning at the south end of the garage, consists of offices for the garage foremen and clerk and the mechanics' locker room. Then comes the stores department, the machine shop, storage battery and electrical shop, blacksmith and welding shop, body and upholstering shop, the paint shop, women's and men's toilet and locker room facilities, drivers' rest room and locker room and finally at the north end, the office of the mechanical superintendent.

Monitors over the full width of the main bay and between alternate groups of columns, skylights over the side bay and almost continuous steel sash along the sides and ends, combine to provide good natural lighting. In addition, sectionally controlled electric lighting is provided on the roof trusses, outlets for drop lights are placed on each column. Angle reflectors are used.

Air, electric and hot and cold water connections are available at alternate columns. The floor is arranged to drain into two full length trenches. In addition to this drainage across the building, the 200-ft. section at the front slopes toward the street entrance at the rate of 6 in. in 100 ft. This slope is continued along the driveway which later will serve as part of the floor of the proposed extension.

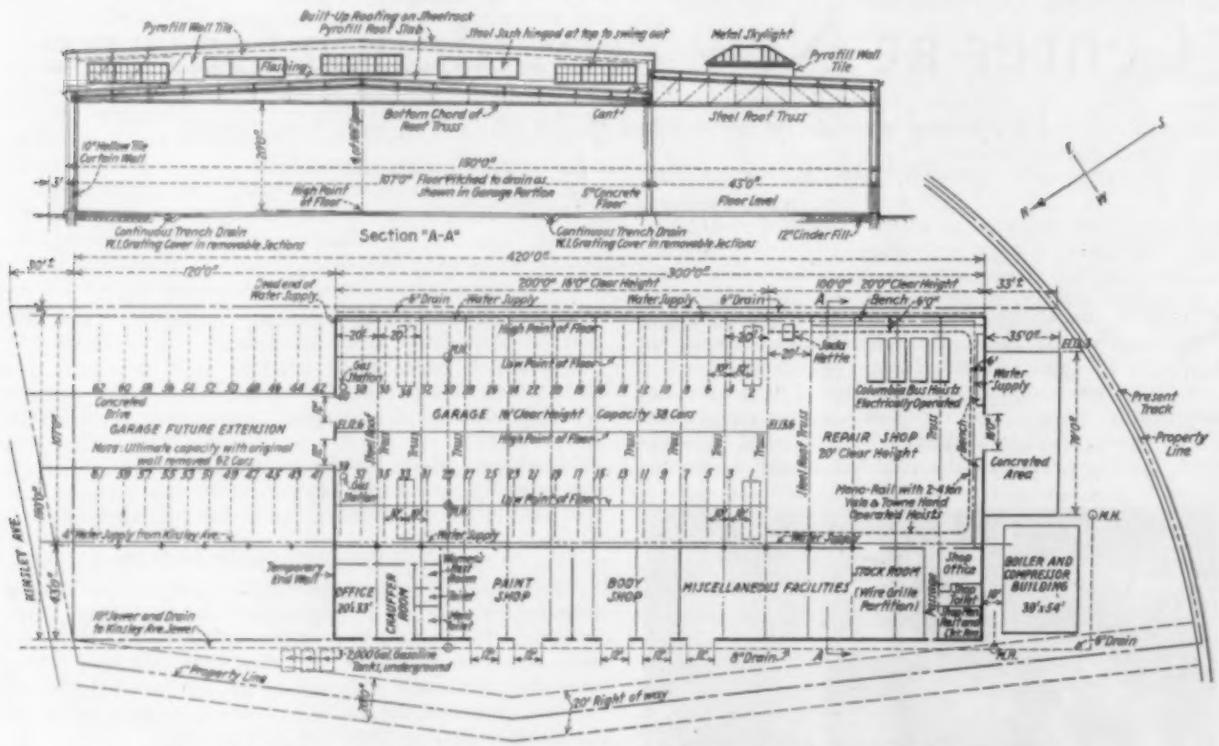
Twenty indirect units take care of the heating and ventilation, except in the side bays, where direct radiation is used. The indirect units are mounted just above the bottom, of the roof trusses and are arranged to discharge air toward the floor at an angle of 45 deg. This system is designed to keep the temperature at 60 deg. in the main part of the building when it is zero outside. The indirect radiation in the offices and other rooms is designed to maintain a 70-deg. temperature under the same outside conditions. The fan units which are the Buffalo Forge "Breezofin" 24-in. type, are intended to recirculate the air and dilute the gases so that any impurities due to the exhausts will be made negligible. Each unit is individually controlled by a ⅓-hp. motor.

The boiler and compressor building, which is separate from the main garage, is 39 ft. by 54 ft. It houses two 15-lb. low pressure oil fired furnaces. The fuel oil supply is kept in two 10,000-gal. tanks buried in the ground outside of the powerhouse. The air compressor is also in the powerhouse.

Fire Protection

The problem of adequate fire protection immediately arises when building a large garage. The fact that a sprinkler system has been installed indicates that this problem has been given careful consideration. In addition, portable 40-gal. extinguishers, a number of 5-gal. extinguishers and sand pails are distributed throughout the building. All construction is of the best fire resistive type. The steel columns are inclosed in concrete and a hollow-tile wall acts as a curtain between the brick pilasters, which in turn enclose the main steel frame.

The garage is located in the first fire district of Providence. A private firebox has been installed connecting directly with the city fire telegraph system. Door openings are provided on three frontages. As indicated in the plan, there are two doors at the front, one at the rear and one at the center on the west side. The body and paint shops are in separate rooms along the west side bay, and each has two doors leading out to a 10-ft. right-of-way. The isolated boiler house is another example of a precaution against fire.



Floor Plan of the New England Transportation Company's Garage at Providence, R. I.

Personnel of Providence Garage

The main difficulty that confronted the mechanical superintendent in building up the shop force for the Providence garage was to secure the services of good all-around automotive mechanics. Not many men of this kind are available. Another condition that helped complicate matters was the fact that the work requires the services of the mechanics seven days a week. The

31-N. E. T.

NEW ENGLAND TRANSPORTATION CO.

DEFECT CARD

Coach No. ..... Date .....

Operator .....

Mark Defects (X); If Defects Not Listed Use "Remarks"

	Foot Brakes Don't Hold		Motor Knocks		
	Foot Brakes Grab		Motor Skips		
	Em. Brake Don't Hold		Motor Has Oil Leaks		
	Em. Brake Grabs		Radiator Leaks		
	Steering Gear Too Tight		Radiator Boils Over		
	Steering Gear Too Loose		Springs Broken		
	Clutch Slips		Carburator		
	Clutch Grabs		Lighting System		
	Gears Shift Hard		Generator		
	Gears Are Noisy		Starter		
	Oil Gauge		Gasoline Leaks		
	Lights		Tools Missing		
	Horn		Buzzer		
	Seats		License Plates		
	Steps		Fenders		
	Windshield		Signs		
	Body Accident		Glass		
	Heater		Mirrors		
	Gas Odor		Windshield Wiper		

Filling Report

	Yes	No	
Gasoline			Mark (X) in Proper Columns
Oil			
Water			

REMARKS:

Card Acknowledged and Defects Remedied:

..... Foreman

A Defect Card Is Punched and Handed in by Each Operator at the End of His Tour of Duty

problem has been solved by specializing each mechanic in one particular branch of the work, thus eliminating the need for all-around mechanics.

The Providence garage is headed by F. J. Swentzel, mechanical superintendent, who has charge of the maintenance of the 190 buses operating on the three divisions of the N. E. T. The complete personnel of the garage is shown in Table I. Of the total personnel of 58, only 10 men are on duty at night, as only inspection, servicing, light repairs and washing are done at that time. The tour of duty is nine hours. The men come to work at different times during the day so that at no time during the 24 hours is the garage without a partial force.

Table I—The Personnel of the Providence Shops and Garage

No.	Position	No.	Position
1	Chief clerk	2	Machinists
2	Clerk—stenographers	4	Helpers
1	General foreman	2	Greasers
2	Assistant foremen	2	Electricians
17	First class mechanics	2	Inspectors
7	Second class mechanics	3	Washers
4	Painters		Stores Department
3	Body workers	1	Storekeeper
1	Welder	1	Stenographer
1	Chauffeur	1	Disbursing clerk
1	Blacksmith	1	Attendant
3	Firemen		

System of Inspection

No accident has occurred to an N. E. T. bus which can be directly or indirectly laid to the lack of proper inspection or maintenance. This is attributed to the vigilance of the terminal inspectors as well as to the daily inspection and testing. Every night the buses are inspected for defects. The motor, steering gear, wheel bearings, propeller shaft, wheel discs, lighting, body condition, tire pressure, tire condition, etc., are tested and inspected daily.

When an operator brings a bus into the garage, he turns in a defect card similar to the one shown in one of the illustrations. On this card, the operator indicates whether or not the car has been oiled and gassed and any defects that may have caused him trouble during his tour of duty. The operator uses his ticket punch

Form 17 NET

New England Transportation Company

COACH INSPECTION RECORD

Speedometer Reading .....

Coach No. ..... Odometer Reading ..... Date ..... Garage .....

BODY	ELECTRICAL SYSTEM	CONTROL SYSTEM	COOLING SYSTEM	SPRINGS
Register and Fittings	Battery ..... Gravity	Steering Gear	Radiator	Spring Leavers
Fare Box and Mounting	Generator	Steering Arm	Water Pump	Spring Clips, Tighten
Ventilators	Starting Motor	Drag Link and Connections	Hose and Connections	Spring Bolts and Bushings
Signs	Magneto	Gas and Spark Control	Water Manifolds	Spring Shackles
Seats and Cushions	Battery Distributor	Oil In Gear Case	Manifold Gaskets	Shackle Side Play
Floor	Ignition Coil	Brake Pedal and Bushings	Fan and Bracket	Grease Pins and Bolts
Doors	Spark Plugs	Brake Rods and Connections	Fan Belt	**FRAME**
Grab Handles	Buzzer	Brake Shaft and Bushings	Oil Fan	Side Members
Steps and Risers	Ignition Wiring	Brake Drums	Grease Pump	Cross Members
Guard Rails	Lights	Foot Brake Lining	**FRONT AXLE**	Frame Bolts and Rivets
Roof	Body and Light Wiring	Kind on	Knuckles, R. and L.	Engine Supports
Windows and Sash	Switches	Kind off	Knuckle Bolts	Spring Supports
Mirrors	Voltage Regulator	Emergency Brake Lining	Knuckle Bushings	General Condition
Heaters	Spare Fuses	Kind on	Knuckle Bearings	**MISCELLANEOUS**
ENGINE	Emg. Door Annunciator	Kind off	Axle Center Body	Tires
Timing	Ampere Meter	Brake Adjustment	Wheel Alignment	Tire Pressure
Bearings	Oil All Units	Brake Performance	Wheel Adjustment	Tire Carrier
Compression	**TRANSMISSION & CLUTCH**	Grease or Oil	Grease all Bearings & Bushings	Hood
Valves and Mechanism	Transmission Case	**GASOLINE SYSTEM**	**REAR AXLE**	Hood Catches
Timing Chain or Gears	Transmission Bearings	Gasoline Tank and Cap	Axle Housing	Emg. Lantern and Brackets
Exhaust Ports	Transmission Gears	Vacuum Tank	Wheel Bearing Adjusted	Registration Markers
Carbon Removed	Transmission Shafts	Vacuum Tank Strainer	Oil Retainers	Bumpers
Stewpot or Hot Spot	Gear Shifting Mechanism	Gas Lines and Connections	Differential and Unit	Fenders
Fly Wheel Ring Gear	Transmission Oil	Carburetor	Axle Shafts	Body Panels
Oil Pressure	Trans. Performance	Air Choke	Differential Oil	Hubodometer
Oil Strainers	Clutch Facings	Air Filter	Grease Wheels	Speedometer
Oil Filter	Clutch Bearings	Carburetor Strainer	**WHEELS**	Crank Handle
Oil Pipes and Connections	Clutch Release	Ground Chains	Wheels	Windshield Wiper
Engine Oil Out ..... Qts.	Clutch Brake	**DRIVE SYSTEM**	Wheel Studs	Horn
Engine Oil In ..... Qts.	Clutch Pedal and Control	Drive Shafts	Wheel Nuts Tight	Whistle
Exht. Gaskets and Manifold	Grease All Connections	Drive Shaft Bearings		Fire Extinguisher
Muffler and Exhaust Pipe	Clutch Adjustment	Universal Discs		Jack and Wheel Wrench
	Clutch Performance	Universal Joints		Reg. Card Holder
		Grease Joints and Bearings		Grease Nipples

Inspected by ..... Inspector .....

A 5,000-Mile Coach Inspection Record Form

to mark the defects listed on the card. As each operator has his own punch, the defect card can be readily identified.

Located at the main passenger terminals are mechanics who are experienced in trouble-shooting, and who have a knowledge of the general construction of the chassis. Each unit arriving at these terminals is given an inspection, including the crank case oil level. The inspector is assisted by whatever information he can secure from the operator as to how the unit is working, and light repairs and adjustments are made between arrival and leaving time.

The cars receive a general inspection every 5,000 miles. The inspector takes one of the coach inspection record cards, one of which is illustrated, and inspects the coach according to the items listed on the card. After he has completed the inspection, he turns the card over to the mechanical superintendent. The items are then listed on a job card, which the shop foreman O.K.'s after the repairs have been made.

The cars receive a general overhauling about every 85,000 miles. This figure depends on the character of service, the physical characteristics of the route over which the bus operates and the type of bus. It has been necessary to give certain buses a general overhauling at the end of 65,000 miles' service. After all the mechanical work has been completed on a car which has received general repairs, the motor is allowed to run for 45 hours in the chassis before the unit is sent to the paint shop. After the car comes from the paint shop it is run for 200 miles by an inspector who makes the final adjustments and inspections. The car is then ready for service.

Lubrication

The New England Transportation Company has made an extensive study of the problems of motor bus lubrication. It has been found that the recommendations of the equipment manufacturers are not always best for economical operation when variations in the lengths of the runs, the frequency of stops and starts and the physical conditions of the routes, etc., are taken into consideration. There is a wide difference of opinion as to when to change the crank oil. A general idea can be had as to when this change should be made, but there are a number of conditions to be considered, such as atmospheric conditions, the grade of oil used and whether the bus is the proper one for the operation. At the present time the crankcase oil is being changed at an average of 1,500 miles, but it is hoped to increase this mileage by the installation of oil purifiers.

The universals are greased every 500 miles. The wheels, steering gear housing, transmission and rear-axle housing are lubricated at each 5,000-mile inspection period. The chassis is greased every 1,000 miles. The greasing is done with 6,000-lb. pressure guns which are portable, electrically-driven, and can be plugged in on a lighting circuit.

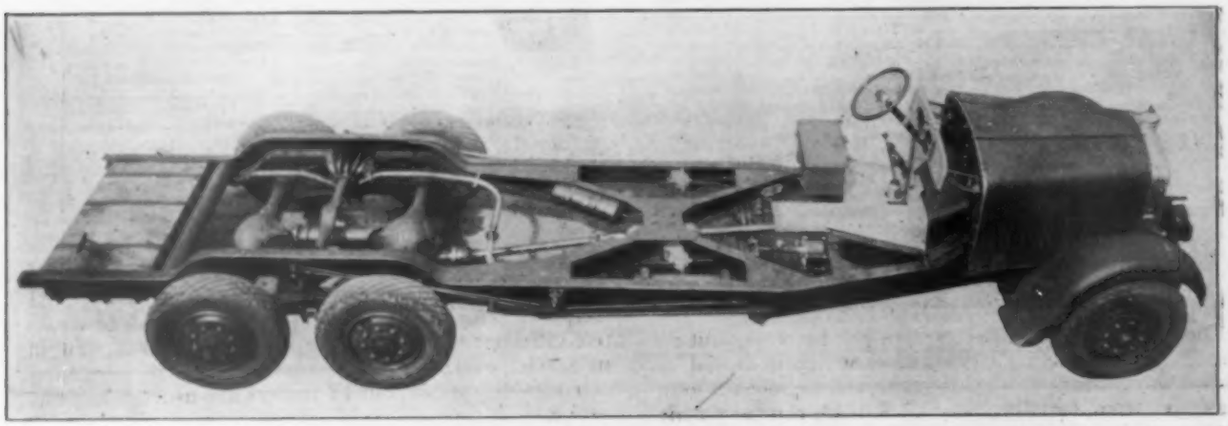
[*The second and concluding part of this article dealing more particularly with the shop facilities provided at Providence, will appear in the July 23 issue of the Motor Transport Section.*—EDITOR.]

Improvements Made in Six-Wheel Bus Chassis

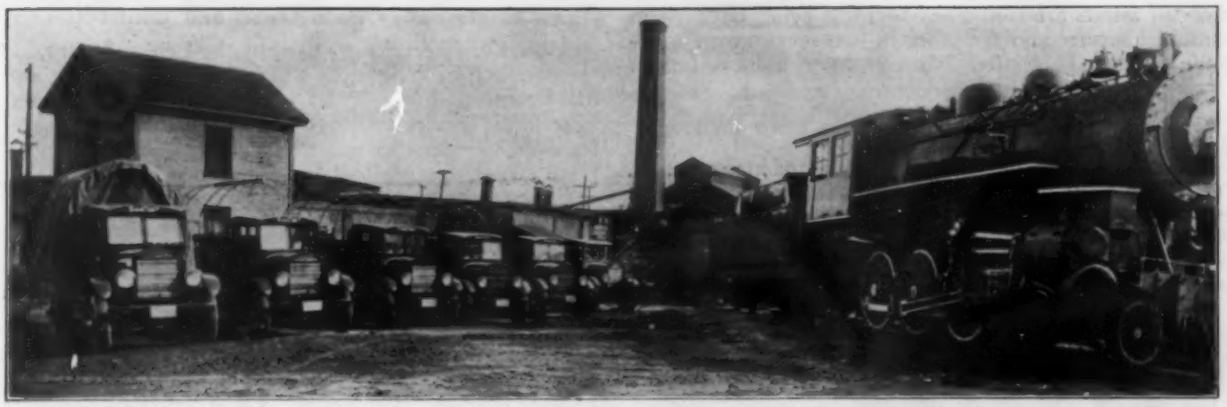
CURRENT models of bus chasses manufactured by the Six Wheel Company, Philadelphia, Pa., have a number of new features contributing to the efficiency of their operation. The most important changes have been made in the braking system. The new brakes are of the locomotive brake shoe type with four shoes for each wheel. All hinge pins and wearing parts of the brake assembly are lubricated. Two separate systems of braking are employed, either Westinghouse Air Brake or B-K vacuum booster brakes being applied for the service brake and an entirely separate B-K booster brake for the hand brake. Each system acts independently of the other and operates 530 sq. in. of brake area.

Aluminum is used at several points in the chassis. A cast alumium transmission cover is furnished, which is quickly removable. Aluminum floor boards are also installed, and the battery is located in a metal box which forms a permanent base for the driver's seat. Duralumin is used for the crankcase in place of aluminum, this metal weighing practically the same as aluminum but possessing greater strength.

Other features of the new chassis include a counterbalanced crank shaft, vibration dampeners and a ventilated clutch. The exhaust is carried to the extreme left rear of the chassis and the heating system used is connected to the exhaust line of the power plant. The gas tank is of 70-gal. capacity and is attached to the frame by spring trunnions which absorb road shocks and prevent gas tank leakage. A permanent dash with instrument panels is now used, all instruments being grouped under glass. The hood is fitted at the factory to ledge on the permanent dash and all chassis wiring is completed to junction boxes on the instrument panel.



The Improved Six-Wheel Chassis



Seven Trucks are Operated by The Maine Central

Trucks, Tractors and Trailers Widely Used

Survey shows 24 Class I railways operate over 1,800 vehicles in freight service

THE number of Class I railways operating motor trucks, tractors and trailers for the transportation of freight is now 24. The number of trucks that they use is approximately 1,637, the number of tractors 58, and the number of trailers 239. Of these 24 roads, 20 use motor vehicles for the transportation of freight within terminals, 13 use them in line service, and 9 in both terminal and line service.

These statements are based upon returns from a questionnaire submitted by the *Railway Age* to the Class I railways, all of whom replied. All of the roads not mentioned specificially in this article replied that they make no use of trucks, tractors and trailers for the transportation of freight, although a large number of them own trucks which are used in their various departments for the transportation of supplies.

The table shows the use being made of motor vehicles by the Class I steam roads. This tabulation, in addition to giving the names of the 24 railways using trucks, tractors and trailers, shows the number of each type of vehicle used on each road and the nature of the service, that is, whether terminal or line service, rendered by the motor vehicles. In a few instances the number of motor trucks in use on the respective railways is only an estimated average, due to the fact that under the contracts which these roads have with truckmen for their truck service, the number of vehicles furnished varies from day to day in accordance with the freight handled.

The various kinds of service in which their trucks, tractors and trailers are being used and the means by which such service is provided, according to the replies to the *Railway Age* questionnaire, are as follows:

A. C. L. Uses Eleven Trucks

The Atlantic Coast Line uses, in all, 11 trucks but no tractors and trailers. One of these, which is owned by the railway, covers a 10-mile route and replaces a local passenger train, handling only U. S. mail, company mail, express and company supplies. The other 10 trucks are contracted for and are used to replace terminal switching service.

The Baltimore & Ohio has an estimated average of 100 trucks, 5 tractors and 10 trailers in operation for freight service in both line and terminal hauls. Two of these trucks are used to replace a local peddler train between Baltimore, Md., and Washington, D. C., these being owned and operated by a Baltimore & Ohio subsidiary.

Tractor and Trailer Used by Rock Island for L. C. L. Freight Handling in Chicago

The remainder of the trucks, tractors and trailers used by the Baltimore & Ohio are furnished by five trucking contractors in New York, for the transportation of freight between Staten Island and Manhattan Island and Brooklyn through the constructive freight station at South Ferry on Manhattan Island.

Large use of trucks, tractors and trailers is made by the Boston & Maine, all of its vehicles being operated supplementary to train service. It has a total of 33 trucks, 6 tractors and 12 trailers in operation, all of which are contracted for. Seventeen of these trucks operate in line service over 78 miles of routes, while the remaining 16 trucks, 6 tractors and 12 trailers are used in terminal service.

The Buffalo, Rochester & Pittsburgh uses two trucks,

both of which are contracted for, one being engaged in terminal service and the other in line service over a 65-mile route. This latter truck replaces a local freight train.

Canadian National Provides Store-Door Delivery

The Canadian National uses a number of motor trucks, estimated at 20, in connection with its store-door delivery system. It has no tractors and trailers, however, and uses no trucks as substitutes for trap car or way freight movements.

The Chesapeake & Ohio operates an estimated average

N. C. & St. L. Truck for Baggage, Mail and Express

of 10 trucks, which are furnished by a contractor. These trucks are engaged in the transfer of freight from the Chesapeake & Ohio freight house at Cincinnati, Ohio, to Cheviot, a distance of approximately eight miles, replacing the rail service between these points. The number of trucks used in this service varies considerably with the volume of business.

The Chicago, Rock Island & Pacific has one tractor and four trailers which are used in the replacement of trap car service between its stations in the Chicago terminal. This equipment is owned by a subsidiary of the Rock Island and under present schedules, about 75 route miles are covered daily.

The Delaware, Lackawanna & Western uses an estimated total of 50 trucks, 3 tractors and 7 trailers in terminal service in the New York district. This equipment is operated by a contractor and is used for handling freight from the Hoboken city house. These trucks, tractors and trailers are used in lieu of lighters for making steamship deliveries and are also used for the delivery of freight through the West Street constructive station to consignees.

One truck, which is owned by the railway, is operated by the Detroit & Mackinac in line service over an 88-mile route. This truck does not replace rail service but is supplementary thereto.

Large Fleet Operated by the Erie

The Erie uses 181 trucks, 15 tractors and 58 trailers in terminal service in the New York district. All of these are operated by trucking contractors. While these trucks, tractors and trailers do not replace rail service, they do replace floating, barge and lighter equipment and also a number of switching movements in the delivery or picking up of freight for its own line and for the transfer of freight for interchange with other roads.

The Great Northern operates no trucks but it uses 17 trailers and 3 tractors which are operated by trucking contractors. All these are used in terminal service, covering two routes, and replace transfer service by rail between its freight stations.

Lehigh Valley Both Owns and Contracts

A total of 10 trucks are used by the Lehigh Valley for the handling of freight, of which 7 are owned by it and 3 are contracted for. The 7 trucks owned by it are used in terminal service and the 3 contracted for, in line service over 380 route miles. The Lehigh Valley trucks replace switching and local freight service.

Four trucks, five tractors and twenty-nine trailers are used by the Long Island in both terminal and line service. All of these are contracted for, the tractors and trailers replacing trap cars between stations and the four trucks being operated in line service over 60 route miles. These trucks do not eliminate any freight trains but they enable a reduction in the number of cars and men on peddler freight trains.

The Maine Central uses seven trucks which are owned and operated by a subsidiary, the SamOset Company. All of these are used in line service over 45 to 46 route miles and supplement, rather than replace, service by rail.

The Michigan Central operates an estimated average of 20 trucks in line service. All of these are contracted for, l.c.l. freight being handled by motor truck between Detroit, Mich., and Monroe, and also between Battle Creek and Niles.

The Nashville, Chattanooga & St. Louis operates two trucks through the Nashville, Chattanooga & St. Louis Motor Transit Company, a subsidiary. Both of these are operated in line service over a 28-mile route, handling mail, baggage and express in replacement of trains.

One Thousand Trucks Used by New York Central

The New York Central is the largest steam railway user of motor trucks for the transportation of freight. It is estimated that through its contracts with a number of trucking companies it is using in daily service approximately 1,000 trucks. These trucks are used for the handling of package freight between freight stations located within a radius of 50 miles, and the number of trucks used for this purpose naturally varies with the

The Baltimore & Ohio Operates Some 70 Trucks in New York

amount of traffic handled. This trucking work is conducted in substitution for the operation of way freight trains. The New York Central also operates, through contracts, a number of tractors and trailers for freight transfer in the New York terminal.

Three tractors and nine trailers are operated by the New York, Chicago & St. Louis under contract with a trucking company. This equipment is used in the replacement of ferry car service in one of its terminals and covers nine route miles.

The New York, New Haven & Hartford uses a total estimated average of 100 trucks in terminal service at various points. Two of these are owned by the railway and are used in the Boston freight terminal. They are

equipped with five demountable bodies and are operated for the purpose of transferring freight between inbound and outbound freighthouses to prevent a 24-hour delay, which was encountered when such freight was transferred in cars. In addition, the New Haven has a contract with an outside trucking company for similar service at Providence, R. I., and a number of contracts with trucking companies for the delivery of freight in New York.

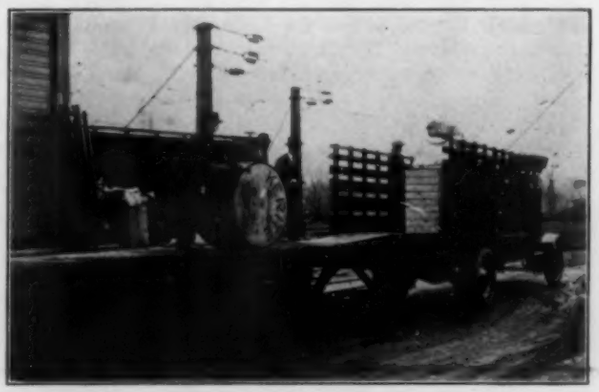
Trucks Used by Steam Railways

Railway	No. of trucks used	Tractors	Trailers	Nature of service
Atlantic Coast Line	11	...	...	Both terminal and line service
Baltimore & Ohio	100*	5	10	Both terminal and line service
Boston & Maine	33	6	12	Both terminal and line service
Buffalo, Rochester & Pittsburgh	2	...	...	Both terminal and line service
Canadian National	20*	...	...	Terminal service—Store-door delivery
Chesapeake & Ohio	10*	...	...	Terminal service
Chicago, Rock Island & Pacific	...	1	4	Terminal service
Delaware, Lackawanna & Western	50*	3	7	Terminal service
Detroit & Mackinac	1	...	...	Line service
Erie	181	15	58	Terminal service
Great Northern	...	3	17	Terminal service
Lehigh Valley	10	...	...	Both terminal and line service
Long Island	4	5	29	Both terminal and line service
Maine Central	7	...	...	Line service
Michigan Central	20*	...	...	Line service
Nashville, Chattanooga & St. Louis	2	...	...	Line service
New York Central	1,000*	4	14	Both terminal and line service
New York, Chicago & St. Louis	...	3	9	Terminal service
New York, New Haven & Hartford	100*	...	...	Terminal service
Pennsylvania	57	3	9	Both terminal and line service
Southern Pacific, Pacific System	2	6	60	Both terminal and line service
Southern Pacific, Texas & Louisiana Lines	25*	...	...	Terminal service
Virginian	2	...	...	Terminal service
Wabash	...	4	10	Terminal service
Total	1,637	58	239	11—Terminal service 4—Line service 9—Both terminal and line service

*Estimated average.

The Pennsylvania operates a total of 57 trucks, 3 tractors and 9 trailers. None of these are owned by the railway, all being contracted for. In line service 47 trucks are used, and in terminal service, 10 trucks and all the tractors and trailers. The trucks used in line service cover the equivalent of 1,086 rail miles and replace local way freight train service. The vehicles in terminal service either eliminate rail transfer of freight or lighterage in terminal areas.

The Southern Pacific, Pacific system, uses two trucks,



One of the 57 Trucks Operated by the Pennsylvania

six tractors and sixty trailers, all furnished by contractors. The two trucks provide a line service and the tractors and trailers a terminal service in lieu of terminal switching. In addition to these, the Southern Pacific lines in Texas and Louisiana have contracts with trucking companies at several terminals for the interchange of l.c.l. or package freight with other carriers by truck in place of trap cars.

Two trucks are operated by the Virginian, one being owned by the railway and the other contracted for. At Roanoke, Va., one truck is used for the interchange of l.c.l. freight with the Norfolk & Western and at Norfolk

The New York Central Is the Largest Railway Truck User

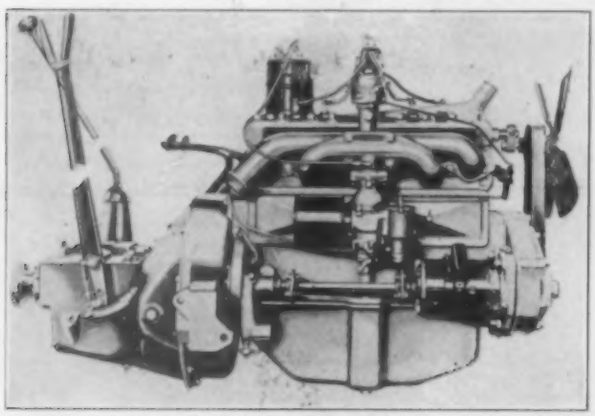
the other truck handles interchange with six steamship lines.

The Wabash recently began the operation of tractors and trailers between stations in Chicago for the replacement of trap cars. This work is done for the Wabash by a contractor who furnishes four tractors and ten trailers for this service.

In addition to the roads listed above, all of the lines entering Cincinnati, Ohio, and St. Louis, Mo., including some of those above, use trucks, tractors and trailers to the extent that they contract with the Cincinnati Motor Terminals Company and the Columbia Terminals Company, respectively, for the transfer of freight. At Cincinnati the roads which contract with the Cincinnati Motor Terminals Company for truck service are the Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis, the Chesapeake & Ohio, the Louisville & Nashville, the Pennsylvania, the Southern and the Norfolk & Western. At St. Louis the roads which contract with the Columbia Terminals Company for truck service are the Baltimore & Ohio, the Chicago, Burlington & Quincy, the Chicago & Alton, the Chicago & Eastern Illinois, the Chicago, Rock Island & Pacific, the Cleveland, Cincinnati, Chicago & St. Louis, the East St. Louis, Columbia & Waterloo, the St. Louis-San Francisco, the Illinois Central, the Louisville & Nashville, the Louisville, Henderson & St. Louis, the Missouri-Kansas-Texas, the Missouri Pacific, the Mobile & Ohio, the New York, Chicago & St. Louis, the Pennsylvania, the St. Louis Southwestern, the Southern, the Wabash, the Litchfield & Madison and the St. Louis, Troy & Eastern.

Redesigned Engine for Graham Trucks

A NEW four-cylinder engine built by Dodge Brothers, Inc., Detroit, Mich., now replaces the engine which has been built into Graham Brothers' trucks for the past six years. More power, greater speed throughout the range of usual operation, quicker pick-up and smoother, quieter operation at all speeds are claimed



The Compact 4-Cylinder Engine Which Replaces the Motor Formerly Used in Graham Trucks

to result from the use of this motor. While the motor develops more power and has greater acceleration, it is said to operate on less gasoline. The chief reasons for this are the improved vaporization of the gasoline due to the design of the intake and exhaust manifolds with a "hot-spot," and to the new combustion chamber with a sloped head. This engine is now used in all Graham Brothers' trucks and commercial cars. It is fitted with a sturdy, heavy-duty transmission and a large single plate clutch, both designed for truck service.

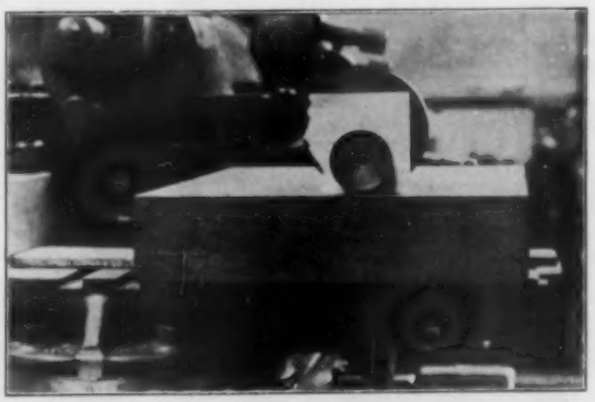
While the engine is a new design, the bore and stroke dimensions are the same as the motor it replaces. The large chrome-vanadium steel crankshaft with five main bearings and two-unit starter generator system are essential features.

The smoothness of power flow resulting from the changes in the engine itself has been enhanced by increased rigidness of the engine supports. This reduces vibration to a minimum and permits much smoother operation at all speeds and under all driving conditions. The distributor is mounted on top of the engine, thus eliminating the possibility of trouble from water and dirt which might enter through the radiator or the louvres in the sides of the hood. The location of the water pump has been improved by placing it at the rear of the engine. From the pump the water goes directly to the rear end of the cylinder block, which is the hottest part. From there, it flows forward to the radiator.

The long hand brake lever has been fitted with a double ratchet and improved release and is exceptionally convenient for quick action by the driver.

A Tool for Centering Piston Heads in a Lathe or Grinder

MANY new pistons are turned and ground to size in the machine shop of the Providence, R. I., garage of the New England Transportation Company. Ordinarily, work of this kind is center punched and held between the centers of the lathe or grinder. This could not be done to the piston heads



A Tool for Centering Pistons in a Lathe or Grinder without Damage to the Piston Head

owing to the thinness of the walls. The punch mark would pierce the head of the piston, thus destroying it. In order to overcome this trouble, a centering tool, shown in the illustration, was designed. The device is 2 in. in diameter, the outside of which is convex and the inside concave. The tool is centered to fit the center on the lathe or grinder. Around its circumference is a ¼-in. rim on which are milled teeth for gripping the piston head. The tool is hardened. By means of this tool any piston with either a convex, concave or flat head can be quickly centered in a lathe or grinder.

The Bus on a Short Line Railroad

Middletown & Unionville uses rail motor car and highway vehicles to reduce costs while maintaining adequate service to public.

THE Middletown & Unionville has been operating a rail motor car in lieu of steam train service for several years. The first rail car used was a highway bus, mounted on rails. Last year the road purchased a Brill model 55 gasoline rail car for this service and in October, 1926, incorporated a subsidiary company, the Middletown & Sussex Transit Corporation, and began bus operation on the highways. With this bus service and the rail motor car, steam trains for passenger service have been entirely supplanted—except on Sundays, when a mixed train is operated.

The Middletown & Unionville was organized in 1913 to take over the Middletown, Unionville & Water Gap, this latter company having been controlled by the New York, Susquehanna & Western. It defaulted on its bonded indebtedness, resulting in a foreclosure. The new company was organized by the bondholders, who bought the former company at foreclosure sale. The line of the original company, from Middletown, N. Y., to Unionville, 13.7 miles, was opened to traffic in 1868. From 1883 to 1913 it was operated by the New York, Susquehanna & Western which connects with it on the south under an agreement terminable on 30 days' notice. Through service between Middletown and New York was operated over this line and the Susquehanna until the formation of the new company, when the connection was broken, the M. & U. operating trains southward only to Unionville and the Susquehanna discontinuing its passenger service at Hanford, leaving a hiatus of a mile or two. The interchange of freight was, however, continued. The road, in addition to its connection with the Susquehanna on the south, has connections at Middletown with the main line of the Erie and that of the New York Ontario & Western. To these three connections the M. & U. turns over a sizeable milk traffic.

An accompanying illustration shows the passenger schedules of the railroad and the bus line. It will be noted that the bus route extends beyond the terminus of the railroad 7 miles to Sussex, N. J. This extension of service was designed to place the area served by the railroad again in easy communication with North Jersey territory, which communication by common carrier was disrupted when through train service via the New York, Susquehanna & Western between Middletown and the south was discontinued.

It will also be noted from a study of this schedule that the bus service is closely co-ordinated with that provided on the rails. For example, the 7:23 a. m. bus from Sussex connects with the 7:45 a. m. rail car at Main street, Unionville, from which point passengers continue their journey to Middletown by rail. Similarly the bus takes passengers from the Middletown to Unionville trip of the rail car, arriving at 7:44 a. m., enabling them to continue the trip to Sussex by bus.

The bus and rail motor car trips are alternated at intervals to provide a steady alternate service throughout the day, rather than unnecessary competition between the two methods of transportation. Middletown (population 22,000) is the only large town in the area served

The countryside is fairly well populated, however, the predominant industry being dairying.

The company is well satisfied with the change to rail motor car and bus operation. It figures that its steam train service costs about $2 per mile, whereas the rail motor car and the bus can be operated for about 26 cents per mile (not including any charge for maintenance of way in the case of the rail motor car).

The M. & U. and Its Bus Lines

Placing the operating cost of the rail motor car on the same basis as that of the highway bus may be considered somewhat unusual, and is explained by the fact that the rail motor car is operated by one man. This man collects tickets from passengers when they board a car and, where necessary, throws switches and performs other functions of a trainman in addition to his duties as driver of the car. The question of flagging is not disturbing, since there is only one other train on the line—a steam train handling freight and milk—and meeting points are absolute on the timetable, or by train order whenever a rare occasion arises when such is necessary.

However, in spite of the parity in cost between rail motor car and the bus on this line, the bus is looked upon with favor. The rather frequent trips of the motor car cause considerable delays in the aggregate to the freight operations on the line, which the bus avoids. Moreover, the bus has the advantage of entering into the heart of the towns served, making its use more convenient for the patrons.

Passenger traffic, necessarily of a local nature, has declined in the Middletown & Unionville territory as it has elsewhere in the country, due to the use of the private automobile. Whereas, just prior to the war, the line had passenger earnings of $1,800 a month, it does well now if it has a gross of $700 a month. Under the circumstances the reduction in mileage cost from $2 to 26 cents has been most welcome.

The highway subsidiary owns two type X Yellow chassis and one Yellow cab truck. One of the buses has an older type body and is used only in case of emergency. The truck the company purchased to handle freight. It has, however, not been successful in building up a large volume of the latter traffic, due to the competition of local unregulated carriers.

The bus in service is kept over night in a public garage at Sussex, where necessary light repairs are made and where gasoline and oil are furnished. Regular repair work, however, is done in the company's own garage at Middletown by an automotive man whose business it is to maintain the three highway units, the rail motor car and section motor cars.

Middletown and Unionville Railroad Company
and
Middletown and Sussex Transit Corporation

West Bound

Bus	17	15	Bus	9	Bus	7	5	Bus	3	Bus	1	Bus
Sunday and Holiday Only	Mixed Sunday Only	Mixed Sunday Only	Sunday and Holiday Only	Motor Saturday Only	Saturday Only	Motor Sat. & Holiday Only	Motor Daily Except Sun. & Holiday	Daily Except Sun. & Holiday	Motor Daily Except Sunday	Daily Except Sun. & Holiday	Motor Daily Ex. Sat. Sun. & Holiday	Daily Ex. Sat. Sun. & Holiday
P. M.	P. M.	A. M.	A. M.	A. M.	P. M.	A. M.	P. M.	P. M.	P. M.	A. M.	A. M.	A. M.
5 50			10 05		7 30			2 05		10 35		
	5 00	11 30		12 35		10 06	5 43		1 03		8 35	
				f		f	f		f		f	
				f		f	f		f		f	
				f		f	f		f		f	
				f		f	f		f		f	
f			f	f	f	f	f	f	f	f	f	
5 35	4 46	11 15	9 40	12 20	7 05	9 51	5 28	1 40	12 46	10 16	9 10	
5 20	4 40	10 47	9 35	12 13	7 00	9 44	5 21	1 35	12 41	10 05	9 03	
				f		f	f		f		f	
5 15	4 31	10 39	9 30	12 05	6 55	9 36	5 13	1 30	12 32	10 00	7 55	
				f		f	f		f		f	
	4 15	10 09		11 53		9 24	5 05		12 25		7 47	
5 05			9 20	11 51	6 50	9 22	5 03	1 20	12 23	9 50	7 45	7 45
	4 05	9 23					4 49		12 09			
f			f		f			f		f		f
4 45			9 00		6 30			1 00		9 30		7 23
P. M.	P. M.	A. M.	A. M.	P. M.	P. M.	A. M.	P. M.	P. M.	P. M.	A. M.	A. M.	A. M.
Bus	17	15	Bus	9	Bus	7	5	Bus	3	Bus	1	Bus

East Bound

Bus	2	Bus	Bus	4	6	Bus	8	10	Bus	16	Bus	18	Bus
Lv. note from Middletown	Motor Daily Except Sun. & Holiday	Daily Ex. Sat. Sun. & Holiday	Daily Except Sun. & Holiday	Motor Daily Except Sunday	Motor Daily Except Sunday	Daily Except Sun. & Holiday	Motor Holiday only	Motor Saturday only	Saturday Only	Mixed Sunday Only	Sunday and Holiday only	Mixed Holiday Only	Sunday and Holiday only
Mile-age	A. M.	A. M.	A. M.	A. M.	P. M.	P. M.	A. M.	P. M.	P. M.	A. M.	P. M.	P. M.	P. M.
			11 00			5 00			11 00		12 05		6 00
	7 00			11 28	4 05		8 35	11 10		7 30		2 15	
1.0	f			f	f		f	f					
2.0	f			f	f		f	f					
3.5	f			f	f		f	f					
4.5	f			f	f		f	f					
5.0	f		f	f	f	f	f	f	f		f		f
5.5	7 15		11 39	11 43	4 21	5 39	8 50	11 25	11 20	8 00	12 25	2 45	6 30
8.0	7 22		11 35	11 50	4 29	5 33	8 57	11 32	11 25	8 35	12 30	3 10	6 35
10.0	f			f	f		f	f					
11.0	7 30		11 30	11 58	4 36	5 39	9 05	11 40	11 30	8 40	12 35	3 25	6 30
12.0	f			f	f		f	f					
14.5	7 42			12 10	4 44		9 13	11 48		8 55		3 40	
14.7	7 44	7 45	11 40	12 11	4 45	5 40	9 14	11 48	11 40		12 45		6 40
15.0				12 17	4 47					9 00		3 55	
18.0		f	f			f			f		f		f
22.0		8 05	12 05			6 05			12 05		1 10		7 05
	A. M.	A. M.	P. M.	P. M.	P. M.	P. M.	A. M.	P. M.	A. M.	A. M.	P. M.	P. M.	P. M.
	2	Bus	Bus	4	6	Bus	8	10	Bus	16	Bus	18	Bus

Connections at Sussex, N. J. with buses to and from Paterson, Franklin, Newton and Hamburgh, and with N. Y. S. & W. R. R. trains.

At Middletown, N. Y., with Buses to and from Newburgh, Montgomery, Pine Bush, Port Jervis and Monticello and with Erie and N. Y. O. & W. Ry trains East and West.

Baggage—Only hand baggage is permitted on Bus.
Express packages weighing not over 50 lbs. will be handled on Bus at reasonable rates.
f Denotes flag stop.
Trains Nos. 1, 3, 5, 7, 9, 2, 4, 6, 8, and 10 are motor trains and will carry passengers and baggage only.
Trains Nos. 15, 17, 16 and 18 are mixed trains and will carry freight, milk, passengers and baggage.

J. A. SMITH, Vice-Pres. & Gen'l Mgr.
Middletown, N. Y.

I. P. DeWITT,
Superintendent

An S. P. & S. Bus on the Columbia Highway in Oregon

The Oregon Bus and Truck Law

Provisions of regulatory statute, generally favored by railways, are most comprehensive

WHILE the Oregon law providing for the regulation of motor vehicle common carriers has been in effect for only a few months, it is considered by many railway officers to be excellent in many respects. It was passed by the legislature of the state in 1925 and was approved in a referendum in November, 1926.

Motor carriers are defined by the law as persons or corporations owning and operating motor vehicles used in the business of motor transportation of and for the general public and not operating exclusively within the limits of an incorporated city or town, motor transportation meaning the transportation of persons or property, for compensation, over any public highway in the state.

All Motor Carriers Common Carriers

Under the Oregon law all motor carriers are common carriers and all come under the jurisdiction of the act. The commission is authorized to supervise and regulate every motor carrier in the state, fixing reasonable rates and fares, prescribing rules and regulations, regulating accounts, service and safety, requiring the filing of reports and supervising the relationship of carriers with the public generally. All motor carriers are required to obtain permits.

Applications for permits are required to be made in writing and to show the name and place of business, the kind of service proposed to be rendered including the number, kind and character of vehicles, where books are to be kept, the territory to be served, a financial statement and any other data or information that the commission may require.

Upon the filing of such an application, it is considered by the commission and if it appears that the applicant is responsible and is capable of furnishing adequate, safe and proper service as a motor carrier, the application is granted and a permit is issued by the commission. Hearings on such applications are held at the discretion of the commission, although no application for a permit is denied without such a public hearing.

The permits issued contain the number of the permit, the name of the holder and whether or not it is for a freight or passenger business. The permit also shows the class of carrier for which it is issued and states the term for which the permit is granted, which does not exceed four years. These permits are not transferable except with written consent of the commission, and they are not considered exclusive franchises to operate in the service and over the routes for which they are granted.

Carriers are required to operate in accordance with the permit except in cases of emergency, such as unavoidable accident or the closing of a road covered by the stated route. The carriers are required to display the number of the permit or certificate prominently upon each side of every vehicle operating under it.

Classifications of Motor Carriers

Motor carriers are classified and referred to as follows:

Class 1. Passenger motor carriers operating on regular routes between fixed termini.

Class 2. Passenger motor carriers operating motor vehicles on call, not exclusively within the municipal boundaries of incorporated cities and towns, and known as "anywhere for hire" carriers.

Class 3. Passenger motor carriers operating a garage and doing a local livery business therefrom, but whose operations are not restricted by the provisions of the act.

Class 4. Freight motor carriers operating on regular routes between fixed termini.

Class 5. Freight motor carriers operating on call not exclusively within the boundaries of cities or towns, known as "anywhere for hire" carriers.

Class 6. Combination motor carriers, carrying both

freight and passengers on the same vehicle and operating on regular routes between fixed termini.

Class 3 carriers are prohibited from operating over any route on which a Class 1 line is operating under a permit granted by the commission. Class 3 carriers are not required to file bonds or insurance but no Class 3 permits are issued except upon the proper showing that the community in which the applicant desires to operate is not served by a Class 1 or Class 2 carrier.

Accounting and Reports

The commission prescribes a uniform system of accounting for motor carriers and all are required to keep their books, records and accounts in accordance with this system. All such accounts are open to the inspection of the commission and are not to be destroyed without its consent. Whenever required by the commission, carriers must furnish it copies of all contracts relating to the transportation of persons or property made by it with any other motor carrier or any other transportation company or common carrier or any shipper.

Annual reports must be filed with the commission on or before the first day of April, covering the year ending December 31, next preceding, and showing in detail, in the case of a corporation, the amount of capital stock issued, and the amount and manner of payment therefor; the dividends paid and the surplus fund, if any, and in the case of all motor carriers, the cost and value of the property, franchises and equipment; the number of employees and officers; the amount expended for improvements and additional equipment and the kind and character of such improvements; the earnings and receipts from each branch of business and from all other sources; the operating and other expenses; the balance of profit or loss; a statement of the indebtedness of the reporting carrier and a complete exhibit of the financial operations of the year, with an annual balance sheet; information in regard to rates and regulations concerning fare and rates; agreements or contracts with other carriers and any other matters that the commission may require.

The commission is authorized to arrange all schedules and to prescribe distinguishing signs, marks or colors by which the various individual carriers may be identified. Direct or indirect compensation for transportation by a carrier not holding a permit is prohibited.

The Oregon law defines "improved highways" as highways improved in whole or in part at the expense of the state, federal government or the county, including paved, macadam and gravel roads, and defines as "unimproved roads" all roads not considered improved roads.

All motor carriers are required to pay to the state an annual charge for the maintenance, repair and reconstruction of highways in the state and for the purpose of defraying the expenses of the administration of the law. Class 1 and Class 2 carriers operating passenger-carrying vehicles pay a fee at the rate of three-fourths of a mill per passenger mile, computed by multiplying the passenger capacity of the vehicle measured at the rate of 20 lin. in. of seating capacity for one passenger by the number of miles traveled. Class 3 motor carriers pay a sum equal to 50 per cent of the regular license tax fee paid upon the registration of such a vehicle used in carrying passengers for compensation in livery business service. Class 4 and Class 5 carriers operating trucks pay a fee at the rate of one mill per ton mile, computed by multiplying the combined weight in pounds allowed such vehicle, according to the number of inches of total tire width thereof, by the number of miles traveled, and dividing the product thus obtained by 2,000. Class 6 motor carriers carrying a combination of freight and passengers pay a fee at the rate of one-fourth of a mill per passenger mile, plus three-eighths of a mill per ton mile of combination motor carriers the combined weight of the vehicle is computed in the same manner employed in computing the combined weight of a truck used for freight carrying only.

Certain deductions from these fees are allowed by the commission. Class 1 and Class 2 motor carriers are allowed a reduction equal to the amount paid by the carrier at the rate of four dollars per passenger seat, while Class 4 and Class 5 carriers are allowed a reduction equal to the amount paid by them at the rate of 50 cents per inch of total tire width.

In computing the number of miles traveled by Class 1 and Class 4 motor carriers the distance between the extreme fixed termini of the regular routes of the carrier is used. In computing the number of miles traveled motor carriers are allowed to deduct from the total miles traveled the number of miles traveled on unimproved roads. Motor carriers also pay a license fee and the fees referred to above are payable monthly. Suitable penalties are provided to apply to carriers failing to make regular monthly reports, or to pay the fees charged, including the cancellation of the permit of the motor carrier in default.

Security Furnished

In granting a permit the commission is required to compel the motor carrier receiving it to file with the commission a liability and property damage insurance policy and an inland insurance policy in such sum as the commission may deem necessary. The commission may also require a satisfactory bond, conditioned on the payment of fees or charges which may be due the state under any permit and for the faithful carrying out of any permit granted by the commission. Cities are not permitted to require bonds in addition to that required by the commission, however.

The new Oregon law applies to all carriers, including carriers in operation at the time it went into effect, although such carriers are not required to apply for a permit under the present law unless and until they desire to extend or shorten service or change their routes. All certificates or permits issued under the old 1921 law, however, expire by limitation four years from the date the present law became effective, subject to renewal or extension as provided in the present law. All carriers, without regard to the length of time that they have been in operation, are required to pay the fees and make the reports provided for in the present law.

At the expiration of the period for which any permit is issued, the holder of the permit may apply for an extension which is granted unless there are reasons to the contrary, for an additional term not exceeding four years. The commission upon complaint or upon its own motion has the power to revoke any permit issued by it when the holder is guilty of repeated violation of the motor vehicle or highway laws of the state.

The Oregon law provides that all rates and fares shall be reasonable and just. Tariffs must be filed with the commission, and changes in tariffs made only on notice to the commission. Notices of proposed changes in tariff are required to be posted by the carrier in a conspicuous place on all motor vehicles operated by it which would be affected by such changes. The form of the tariff may be prescribed by the commission and it may also investigate and suspend rates.

Adequate service is required to be rendered and both rates and service may be investigated by the commission. The service performed may also be regulated by the commission with respect to additional facilities, vehicles, stations, operators, equipment, repair and so on.

The Pro and Con of Tire Purchase vs. Tire Rental

Of nine bus companies replying to inquiry, four buy and five contract for this equipment

OF nine roads replying to a questionnaire asking their views regarding the best and cheapest method of obtaining and operating motor bus tires, four disclosed that they are buying their tire equipment while five stated that they were renting them. The four roads which are buying their bus tires indicate that they may ultimately change their practice and secure their tires through rental contracts.

Rental Variations

Tire contracts are customarily placed on a confidential basis, so that little information as to the amounts that railway bus companies are paying as rental for their bus tires can be secured for publication. These amounts vary so widely, however, as a result of local factors entering into the establishments of rental rates, that the publication of them would be of little value. The physical characteristics of the routes over which buses operate, the size of the fleet covered in the contract, the condition of the tire and rubber market, and other conditions exert an influence on tire rental rates.

Rental Cheaper Than Maintenance

One of the roads which is now renting its tires originally bought them but changed to a renting policy when it found that it could rent tires at a rate less than the amount of upkeep alone of its owned tires. The seriousness of the amount of maintenance cost was due to the physical characteristics of a part of the roads over which its buses moved.

The Practice on the Northland

The Northland Transportation Company, subsidiary of the Great Northern, also contracts for its bus tires and has always done so. The rate that it pays per mile, which it is not at liberty to disclose, covers not only the provision of the tires themselves but also the charge for their maintenance, all repairs being made by the tire company. This is the customary practice in renting bus tires and is one of the advantages of renting tires, entirely aside from the cost factor, which bus operators consider strongly. It relieves them of responsibility for tire repairs, renewals, and so forth.

New England Pays 1.55 Cents Per Mile

The New England Transportation Company, the New Haven bus operating subsidiary, likewise pays for its tires on a mileage basis. According to F. S. Hobbs, manager of the N. E. T., this practice has been found to cost less than ownership and maintenance of tires purchased outright. The rate paid by the New England Company for its tires is 1.55 cents per mile. This compares with a cost of 2.20 cents per mile which the company figures it would have to pay if it owned its tires instead of renting them.

The Fifth Avenue Coach Company, which operates the fleet of B. & O. buses between trainside at Jersey City, N. J., and a number of points in New York and Brooklyn, secures its tires on a contract, so-much-per-mile basis. According to M. F. Steinberger, special engineer on the staff of the operating vice-president of the B. & O., "it seems to be the general opinion that the purchase of tires on that (the rental) basis is a good one," and is the one which the B. & O. has in mind to follow when it installs motor buses on other projected lines in the future.

SamOset Buys

Three of the four companies which buy their bus tires have operations of a special or limited nature. One of these is the SamOset Company, subsidiary of the Maine Central. D. C. Douglass, managing director, states: "We buy tires outright, but owing to our bus operation being only seasonal, we have no accurate data available in connection with tire cost per mile."

O. W. R.R. & N. Studies Question

The Oregon-Washington Railroad & Navigation Company is giving close consideration to the question of tire purchase vs. tire rental since it is about to begin the operation of a bus line of some size, between Portland, Ore., and Pendleton. On its present bus line between Pendleton and Walla Walla, Wash., according to J. P. O'Brien, general manager, tires are being purchased outright. Since the operation is small, data as to the cost of tires is not available.

The Rutland Transportation Company, says G. L. R. French, assistant vice-president and general manager of the railway, buys its tires outright because its operation is so new that statistics are not yet available to show the cost per mile and a fair rental price cannot be determined. The Rutland buses began operation less than a year ago, in September, 1926.

Denver & Interurban May Change

W. H. Edmunds, general manager of the Denver & Interurban Transportation Company, a Colorado & Southern subsidiary, is buying tires for his company's buses but he believes that a rental basis may soon be found preferable.

"At the present time," says Mr. Edmunds, "we are buying all of our tires outright and running a number of different makes in an endeavor to discover not only the make which will give the maximum service at the minimum cost, but also to ascertain which make may be expected to provide the minimum number of delays to traffic within the proper life expectancy, as we consider this latter point as bearing as directly on tire value as does the cost of the tire itself.

Supervisory Effort of Tire Company

"Using all dual equipment of 12-14,000 lb. weight, our tire cost up to the present time has been approximately 1.5 cents per mile. After determining the proper equipment, I am inclined to think that a rental basis may be preferable, if based on proper performance, as our operation would thereby have the supervisory efforts of the tire company in addition to our own."

The Liability of Motor Truck Carriers*

By Parks C. Archer
General Claim Agent, Chicago & Alton

A TRANSFER or drayage company or any motor transportation company which undertakes to transport from place to place for hire the goods of those who employ it is a common carrier and has been so held by the courts. In Illinois and in most states such carriers are subject to regulation under public utilities acts. For example they first must obtain a certificate of public convenience and necessity from the regulatory commission before they can begin operation. They must file with the commission and publish schedules of their rates and charges and must conform to those charges. They must make certain reports and in some other instances must do the same things the railroads are required to do.

Motor carriers, however, are not subject to the limitations placed on railroads by the federal Interstate Commerce Act, as they are not included among the kinds of carriers mentioned in the Act, and insofar as the Interstate Commerce Act prescribes liabilities and limitations on the liability of common carriers by rail, the highway motor carrier is free from them. The Illinois Public Utilities Act does not cover the phase of liability and the highway motor carriers are left to the common law for a definition of their liabilities.

Generally speaking, a highway motor carrier is liable, like the railroads, for the full actual loss, damage or injury suffered while a shipment is in its possession for the purpose of transportation. It is bound to use the highest degree of care to preserve the property and to deliver it safely at destination. If it can prove that it was using the required degree of care, it can avoid liability by proving that the damage occurred by reason of causes beyond its control.

In reverting to the common law on liability of motor carriers, there arises again the question of whether such a carrier can provide, in its contract, receipt or whatever bill of lading is issued, for limitations on its liability. On this subject, Hutchison in his treatise on carriers, says (pp. 480-490):

"The question whether the carrier can exempt himself from liability for losses occurring from the negligence of himself or his servants or employees is one upon which the authorities differ. By the English law he possesses the unlimited power to do so under the several acts in relation to carriers, and the construction which has been given them by the English courts. In this country, since it has been admitted that he might contract for a limited liability, various opinions have been entertained by the different courts upon the question whether, conceding this general right, an exception ought not, upon grounds of public policy as well as upon legal precedent, to be made, of the power to enter into contracts to screen himself from the consequences of negligence in the performance of his duties.

"Our state courts are divided upon this subject, as we have seen them to be upon several other questions relating to the rights and duties of carriers; and this difference exists not only in the unqualified concession of the power of some of them and its unqualified denial by others, but among those which concede the power, some attempt to put a limit upon it by distinguishing between the different degrees of negligence, allowing it only as to slight or ordinary negligence, but not as to that of a grosser character. But the great weight of authority in this country is in favor of excluding it altogether as an element of contract between the carrier and his employer, and of holding the former to a rigid responsibility for every degree of negligence, without the power by contract or in any other mode to divest himself of it.

"The other view of the question is, however, taken by some of the courts of the highest authority. In some of them the unlimited power is allowed to carriers to contract for exemption from all liability arising from or caused by negligence of every degree. In others they are permitted to contract for exemption from liability arising from negligence of every degree excepting that which is characterized as gross or wilful. But all of the courts agree that the contract for such an exemption, to be effective, must contain clear and distinct expressions for that purpose, and mere general terms of exemption, such as that the carrier 'shall not be held liable for loss or damage,' will not be construed as extending to loss or damage by negligence. In other words, the exemption from liability for negligence must be express, by the use of the word itself or of something equivalent; and in construing the terms of such contracts, where the claim is that such an exemption has been agreed to, the words will be taken most strongly against the carrier whose language they are and who is in an advantageous position for dictating the contract.

While, generally speaking, the Supreme Court of the United States, in a series of cases, has been generally inclined to restrict carriers for exemptions from responsibility, holding such exemptions are not just and reasonable in the eye of the law, it has been held that it is not just and reasonable for a common carrier to stipulate for exemption from responsibility for the negligence of himself or his servants. These rules apply both to carriers of goods and carriers of passengers and with special force to the latter.

"The court of appeal of New York, however, have come to a somewhat different conclusion than that arrived at by the Supreme Court of the United States in this particular line of cases. The New York courts have repeatedly held that carriers had the power to stipulate for exemption from responsibility in cases caused even by gross negligence of the agents of the carriers. The highest court of that state has expressly refused to follow the rulings of the United States Supreme Court upon this question as not binding upon the state courts. But in all these cases it is held that the language of the contract, to protect the carrier from the consequences of his negligence, must have clear, direct and unmistakable reference to the subject of negligence; and where its language was that the carrier 'should not be liable for the loss or damage of any box, package or thing for over fifty dollars unless the true value be stated,' it was held that there was not in its phraseology any such clear and distinct expression of exemption from loss by negligence as the law required.

"According to the decisions of the courts of Illinois, the carrier is permitted to contract against liability for the acts or omissions of himself or his servants, providing they are not of such a character as to amount to gross negligence. But since it is held that gross negligence is a failure to exercise ordinary care in view of the circumstances of the particular case, contracts which operate to exempt the carrier from liability, where he has failed to exercise ordinary care in the transaction of his business as a common carrier, are considered unreasonable, and where there is some evidence of negligence adduced, the question whether it was gross in character is held to be one of fact for the jury."

*From a discussion of carrier liability before the Joint Freight Claim Conference in Chicago on April 13.

Motor Equipment Adopted by the Chicago Tunnel Company.

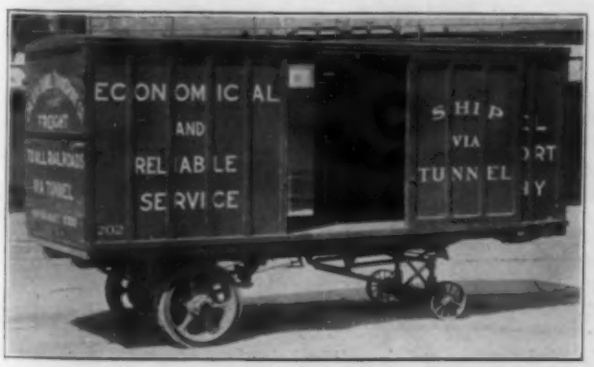
Chicago Tunnel Company Adopts Store Door Delivery

Transfer service extended to warerooms of shippers with initial equipment of 2 tractors and 10 trailers

THE Chicago Tunnel Company, which operates 61 miles of underground railway in Chicago, serving virtually all railway freight stations and 26 stores and factories through local underground stations, has undertaken the extension of its l.c.l. freight transfer service by the inauguration of a system of store-door pick-up and delivery. The tunnel company, with its many connections, does a large transfer business on its underground lines, handling last year more than 525,000 tons of l.c.l. freight. Twenty per cent of the outbound l.c.l. freight traffic from the downtown district of Chicago, which amounts to 3,000 cars daily, is handled by the Chicago Tunnel Company.

In instituting store-door delivery the company is not attempting to compete with drayage companies but rather is offering the service to shippers who operate their own fleets of trucks for handling freight to and from the Chicago Tunnel Company's freight stations. It is felt that the Tunnel company will be able to render its store-door service at a rate which will be less than the cost to a shipper of operating and maintaining his own trucks.

Two Mack Tractors and Ten Semi-Trailmobiles Comprise the Present Fleet



The Trailers Have Both Side and End Doors

Four receiving stations for the handling of both inbound and outbound freight are maintained by the Tunnel company, these being used for the receipt and delivery of l.c.l. freight of stores and factories which do not maintain direct underground connections with the Tunnel company's lines. Public station No. 1 is located at West Jackson boulevard and South Halsted street; station No. 2 at Kingsbury and Ohio streets; station No. 3 at Seneca street and the Chicago river;

and universal station No. 4, the largest, at Twelfth and Canal streets.

At the present time the store-door pick-up and delivery service is being operated only to and from the universal station at Twelfth and Canal streets. This station has 24 outbound and 6 inbound doors, of which 9 are reserved for the motor equipment of the Tunnel company.

2 Tractors, 10 Trailers Used

At the present time two tractors and ten semi-trailers are being used in the furnishing of the store-door service. In most instances the companies using the store-door service are located only a short distance from the Tunnel company's freight station, so that a comparatively small amount of the delivery time is consumed in the trip between the freight station and shippers' and consignees' doors, the major part of the time being consumed in loading and unloading. Tractor and trailer equipment was adopted to meet this situation, the tractors being kept in operation almost constantly from early morning until evening, with the trailers, the overhead on which is very little, doing the waiting.

Except in the case of very large users of the store-door service, the trailers are dispatched to shippers' doors for the pick-up of freight on the shippers' order, no regular schedule being maintained as yet. Deliveries

		A Company lb.	B Company lb.	C Company lb.	D Company lb.	E Company lb.
April	9.....	32,440				
"	9.....	27,271				
"	11.....		20,268			
"	11.....		18,777	25,758	21,913	4,265
"	12.....		22,904	15,912	10,366	5,690
"	12.....			26,271		
"	13.....		22,074	26,092	5,916	8,000
"	14.....		19,973	12,994	1,370	9,380
"	15.....		20,288	29,218	6,941	7,010
"	15.....		20,067			
"	16.....		18,736	10,090	7,347	2,230
"	18.....		19,476	35,561	3,869	9,715
"	19.....		20,042	3,586	5,519	8,315
"	19.....		19,953			
"	20.....	30,780	20,142	8,828	17,567	5,490
"	20.....	19,708				
"	21.....	26,714	20,281	16,087	16,051	6,195
"	21.....	26,693	20,242			
"	22.....	35,424	19,897	26,469	4,500	7,585
"	22.....	22,165				
"	23.....	40,478	20,880	8,996		9,605
		261,673	324,000	245,862	101,359	83,480
		131 tons	162 tons	123 tons	51 tons	42 tons

509 tons—outbound freight.
Average—42 5/12 tons per day out.

are made once a day or more frequently if the amount of traffic is sufficient to require several deliveries in one day.

The initial order for tractor and trailer equipment placed by the Chicago Tunnel Company consisted of two 10-ton Mack tractors, manufactured by Mack Trucks, Inc., and ten 10-ton semi-trailers, manufactured by the Trailmobile Company, Cincinnati, Ohio. The trailers are 20 ft. long, 7 ft. wide and 6 ft. 6 in. in height inside. They are of the interlocking type and have two side doors and an end door at the rear. The side doors are of the sliding type and may be locked and sealed. The end doors, which are hinged, are so arranged that they can be lifted off their hinges without their being swung open, this facilitating the opening of the trailers at platform doors where there is insufficient room for the doors to be swung open on their hinges. A removable bar which can be locked and sealed in place prevents the unlawful removal of the end doors. The trailers are painted blue and, as indicated in the accompanying illustrations, bear lettering identifying the service that they render.

In a 14-day test of the tractor and trailer operation, one tractor and five trailers handled 509 tons of outbound l.c.l. freight from five manufacturing companies, averaged 42 5/12 tons per day. The record day during this test, as indicated in the accompanying table, was April 21, when more than 65 tons of outbound l.c.l. freight were handled. In another test, one tractor and five trailers handled 62½ tons of freight in one day. The store-door pick-up and delivery service of the Chicago Tunnel Company began officially on May 23, in a small way. Additional service will be rendered as the equipment is received. All of the equipment on the initial order will be ready for service by July 1.

S. A. L. Makes Its First Application for Bus Permit

THE Seaboard Air Line has applied to the corporation Commission of North Carolina for permission to inaugurate motor bus service from its western terminus at Rutherfordton to Lake Lure, Chimney Rock, Bat Cave and intermediate points (about 20 miles, in the direction of Asheville). This is the first application of the Seaboard for authority to establish a bus line and, in addition, will be, if authorized, the first railroad intra-state bus route in the state of North Carolina.

The territory which the Seaboard proposes to serve with this bus line is without railroad facilities at the present time, so that the proposed bus operation may be looked upon as a railway "feeder" service rather than as a substitute for trains.

A Communication

NEW YORK.

TO THE EDITOR:

In selecting the proper size of bus with respect to seating capacity, it is my practice to choose equipment for motor coach installations only after a thorough study of the proposed operation and a reasonably accurate forecast of the amount and nature of the traffic to be handled have been made. Such a study includes estimates of the maximum traffic to be expected at any time, the number of times during a year that this maximum will probably be handled, the spread of traffic throughout the normal day, seasonal variations, and all other data of this nature which it is possible to develop. With this information as a basis, it is possible to determine very definitely the seating capacities of the vehicles which will be required for the various trips of the schedule.

Inasmuch as operating costs vary directly with the size of the vehicle used, it is important that the smallest unit which will handle the job be purchased. The 21-passenger unit has usually been found adequate as a substitute for branch line train service, and a coach of this size is ample for general use in all but the more densely populated sections of this country. In a few instances, 29-passenger units have been found desirable. In this connection it is important to consider the possibility of party service as the larger coach is usually found to be necessary in this work.

F. J. SCARR,
Scarr Transportation Service.

"THERE WILL COME, I think, a limitation of the field of long distance motor bus travel, a gradual return to equilibrium, but there are great strides to be made, I think, in the substitution of the motor bus in branch line service and in local service between adjacent cities."—*Professor W. J. Cunningham of Harvard University in speaking before the New England Railroad Club.*

The Great Northern, Through the Northland, Is One of Many Roads Co-ordinating Railway Highway Transportation

Bus Experts Discuss Rail-Highway Co-ordination

Three speakers at A. A. A. Bus Division meeting agree that railways are logical highway vehicle operators

THE railways are the logical operators of motor buses and are best able to effect the proper co-ordination of rail-highway transportation, according to three speakers at the first annual meeting of the Motor Bus Division, American Automobile Association, which was held at Philadelphia, Pa., on June 15-16. These speakers, A. J. Brosseau, president of Mack Trucks, Inc.; F. J. Scarr, of the Scarr Transportation Service and Bert W. Arnold, assistant general manager of the Chicago, North Shore & Milwaukee, agreed that the motor bus is a transportation tool of untold potentialities and considerable actualities, and that its greatest development will follow its general adoption by the old-established transportation companies, the railways.

The remarks of these speakers are abstracted below:

The Railways Will Use More Buses

By A. J. Brosseau,
President, Mack Trucks, Inc., New York

When the bus first made its appearance in the rural field, there was the common impression among rail operators that it was destined to make serious inroads upon their passenger business. Events of the past year and particularly the investigation of the Interstate Commerce Commission have done much to clarify this situation and bring out the facts. We have only to read the testimony of the railroad officials to appreciate that it was the private automobile—not the bus—which was responsible for nearly all railroad passenger business losses.

It would be interesting to learn how much of the business lost by the railroads and trolleys, because of the use of the private automobile, might be regained by bus operation. I am convinced the greater part of this "lost" business can be regained by many rail lines through the bus without further loss to their revenues.

In the April Motor Transport Section of *Railway Age*, R. J. Littlefield, of the Boston & Maine, tells us it costs from $1.17 to $2.02 per mile to operate steam trains, while buses cost from 26 cents to 30 cents per mile. Complete and partial substitution for 92,653 steam train miles, with operating expenses of $113,672, was effected with 251,843 bus miles, with operating expenses of $65,972, or, as Mr. Littlefield says, "The saving to the Boston & Maine is the difference in cost of operation."

The experience of the railroads now operating motor buses would doubtless tell a similar story of savings effected by the substitution of the bus for the unprofitable branch line rail operation. Of course, not all railroad operations lend themselves as well as does the Boston & Maine to the substitution of buses for rail operations, but when millions of dollars of potential savings are involved railroad management may be expected to be alert to its opportunity.

Railways Will Use More Buses

I believe that as railroad men give more and more time to the study of savings in costs to be effected by motor transportation, they will turn increasingly to the use of the bus for local operations. In many instances this would mean competition with, or acquisition of, or contract relations with existing independent bus lines. But whatever the method, there will be an expansion of bus services by rail operators, who will then, without extra cost to them, be enabled to give the public more frequent and satisfactory service.

The Proper Place of Trains and Buses

By F. J. Scarr
Scarr Transportation Service, New York

The motor coach, while a comparatively small factor in point of numbers in the present stage of motor vehicle development, is potentially of the greatest importance. Of the 19,000,000 passenger motor vehicles registered during 1926, only 80,000 were motor coaches, and many of these scarcely deserved the name. Of this number, 38,000, or nearly one-half, were engaged in school, sight-seeing, hotel and other non-common carrier service. The remainder, while largely a development of the last five years, represents in number approximately 75 per cent of the steam passenger equipment and in seating capacity over 20 per cent.

The S. P. & S. Is a Pioneer in Bus Operation

The physical characteristics of the motor coach and the steam train naturally influence their economic relation. The motor coach is designed to handle small groups; it is highly flexible as to time of movement and route of travel, is not dependent upon rigid schedules, and approaches the convenience of individual service. The steam train is designed to handle large groups of passengers; generally operates at higher speeds, and is confined to fixed schedules and routes.

The motor coach, moving through the main streets of cities and towns, rather than the "back yards," and traversing generally more pleasant routes, free from smoke, cinders and noise, adds attractiveness as well as convenience to travel, thereby enhancing the intangible, but certain, desire to "ride on rubber."

The steam passenger train must have all traffic brought to and taken from its stations. The motor vehicle picks up and deposits the greater portion of its traffic at or near the originating point and final destination. This is one of the essential differences between the two modes of travel.

The cost of motor coach operation is considerably less than that of the steam train; the relation being approximately $.30 per mile (total cost) for the former and $1.10 or more per mile (out-of-pocket) for the steam train. If, for example, there were 300 passengers to be moved at one time from Philadelphia to Atlantic City, the steam train would be more economical, as it would cost approximately $1.10 per mile as compared to $3.00 per mile for ten motor coaches. However, if but 30 passengers were to be moved, the economic choice would be reversed, the steam train costing $1.10 per mile against but $.30 for the one motor coach.

Field of Motor Coach Service

Combining the physical and economic factors, we find the lower unit mile motor coach cost permitting a three or fourfold increase in schedule frequency at the same total cost, bringing the highway vehicle to a point of convenience more nearly in accord with the private automobile. The relation which these two vehicles bear to each other seems to narrow down to the following two factors, operating conditions permitting.

1. The more economical vehicle is determined by the volume and flow of traffic. (Approximately 100 passengers per trip or per group being the dividing point.)

2. The convenience factor, generally speaking, for reasonable distances, completely favors the motor coach. (Distance, as it affects convenience, necessarily varies in every instance, depending upon traffic; road and other conditions that influence the rate of travel as compared with the same movement by rail. Distance is limited only by the willingness of the passenger to travel at what is usually the slower pace of the motor coach.)

Having outlined the general characteristics of organized rail and highway passenger transportation, let us examine the field of service that must ultimately be apportioned between them in accordance with their respective economic merits and/or public demand. Let us then apply the characteristics and determine the potential possibilities and the probable future relations of each method to the other.

The field of service involves both the traffic to be moved and the area within which or the routes over which such traffic moves. The traffic now being handled by railway and highway falls naturally into two general groups: Long haul and short haul, each of which is further divided into mass or large group and individual or small group. The division of traffic in this manner clearly suggests the mode of transportation best suited to handle each class.

The division of traffic between the railway and highway is already in the process of adjustment. A review of the passenger traffic handled by the railroads of the United States during recent years indicates a rapid and steady increase from 1900 to 1910. The rapid increase ended abruptly at this period and except for one brief decline, continued to advance, but slowly, to a peak in 1920. From the 1920 peak to 1925, a sharp decline in total passengers carried has been experienced by the railroads, rather than the increase which would naturally be expected from increases in population and industrial development.

Accompanying the decline since 1920, however, the average journey per passenger has steadily lengthened; this, with other available facts, indicating that the long haul traffic enjoyed by the railroads is increasing. The commutation traffic has also increased steadily since 1920. It is quite evident, therefore, that the only remaining class of traffic, i.e., the "short-haul single-ticket" or small group business, has declined sufficiently to account for the increase in long-haul and commutation traffic as well as the sharp decline in the total passengers handled.

The private automobile, which because of its convenience and flexibility has absorbed most of the traffic lost by the railroads, as generally indicated above, has also tremendously increased the riding habits of the

people and thereby created a new and larger traffic peculiar to itself. The motor coach, advancing into the field of organized highway transportation, has drawn its traffic largely from the private automobile, and as traffic congestion and parking regulations become more severe and a more general knowledge is attained by the private automobile owner of the cost of supplying himself with this convenience, the motor coach will draw its patronage more and more from the private automobile rider.

The motor coach, in its own economic right has a definite, a large and a sound development ahead. As a sound phase of transportation, it must bear certain definite relations to other modes and particularly to the steam railroads. These relations are not difficult to foretell, in the light of available facts and the steps being taken by the transportation interests generally to bring about a better co-ordination of transportation facilities.

The tremendous loss of passenger traffic recently experienced by the railroads, amounting to more than $230,000,000 annually—compared to 1920—has affected almost exclusively the local passenger train revenues. A careful survey of this phase of railway transportation indicates that a large percentage of local steam passenger trains are not earning sufficient passenger revenues to pay the "out-of-pocket" costs. These trains are, therefore, generally averaging a smaller number of passengers than can be accommodated in a single 30-passenger motor coach. The through passenger business has been little affected, except in rare instances. Pending the development of commercial aviation, the steam train will probably continue to meet the long-haul requirements.

The foregoing, coupled with the obvious characteristics of the steam train and motor coach, leave little doubt about the future apportionment of available traffic. Of the mass or "large group" movement, the steam train will handle the long-haul portion for many years to come and such of the short-haul portion as may not be handled by terminal rapid transit systems. Air transport will affect but little this class of traffic, at least for many years.

Of the individual, or "small group," movement, the

The New England Is the Largest Railroad Bus Operator

steam train will gradually give up much that still remains of the short haul portion to highway transportation. The highways will also assume some small portion of the "longer haul." Air transport will ultimately take the principal role in handling the long-haul small-group traffic.

Use of Motor Coach by Railroads

Evidence on every hand indicates an awakening to a better understanding of the fundamentals herein discussed. The motor coach is already being utilized to good advantage in co-ordination with steam train service and such relations are being rapidly extended. Many local steam trains have been replaced by motor coach service, where highways have permitted. Many local or semi-express trains have been speeded up by the elimination of stops at the smaller stations, the local service being performed by motor coach. In a few instances motor coach lines have been installed between cities to defeat competition. In many instances, the motor coach has been used to serve new territory for the development of new business. In a few instances, the motor coach is in use as a terminal feeder service for the convenience of through passengers in entering or

The North Shore Line, One of the First Railway Bus Operators, Has More Miles of Bus Lines Than Railway Lines

leaving a large terminal area. This will undoubtedly be rapidly extended.

While these and other services have long held forth opportunities for operating economy and improved service, they have been slow of development. Political, legal, policy, traffic and operating difficulties have prevented prompt action. So many installations have proved successful, however, that there is little doubt as to the rapid and sound growth of the use of the motor coach in co-ordination with steam rail service.

Who Should Operate the Motor Bus?

By Bert W. Arnold
Assistant General Manager, Chicago, North Shore & Milwaukee, Milwaukee, Wis.

The arrival of the motor bus in the transportation field is an event too recent, the experience with it too limited, to prove fully its possibilities as a public carrier. There can be no question about its usefulness, nor of its increasing popularity with the traveling public, but what its limitations are, or whether it has any limitations, are still subjects of controversy.

The companies with which I am associated under the direction of Britton I. Budd, were among the first in the country to adopt the motor coach as a part of their passenger equipment. At the present time our associated companies are operating 259 motor coaches over 1,004 miles of regular routes representing a capital investment of upward of $2,500,000 and doing an annual gross business of more than $2,000,000.

Some thirty or forty years ago when the linotype machine was developed, adding a new tool to the printing industry, the publishers and printers who had previously been setting type by hand hailed the new invention as a useful tool in their trade. They installed the machines in their printshops, operated them by skilled printers and continued in the business which they had learned from the ground up. The result was a tremendous increase in the volume of printing produced and consequent

benefit to the public. The point I make is that the same men who were skilled in the printing business remained in that business, making use of the new tool to increase their output and to serve the public better.

The situation in the transportation industry is much the same as it was in the printing industry a generation or more ago. The motor coach has been developed and is a new and useful tool in the hands of skilled operators who have made transportation their life work. In the hands of inexperienced and irresponsible individuals it may easily become the reverse of useful, a disturbing and destructive factor in the industry, which in the long run can only be harmful to bus manufacturers, to the old established and experienced transportation companies and to the traveling public.

The relation between the motor bus and the electric railway company, as I see it, is so close that they should not be separated. As transportation agents our business is to serve the public. In giving that service we should use every tool at our command. There has been a tendency on the part of electric railway operators in the past to regard themselves as strictly railway men. To some extent that is true today, although the increasing number of railway companies which are adopting the motor bus is evidence of the fact that they are awakening to a realization of their proper place in the transportation industry, that is to supply the public with the kind of transportation service it wishes to have, whether on teel rails, on rubber tires or in the air. The tool to be used should not change the status of the transportation company.

Who is the more likely to find the proper place of the motor bus in the transportation field, the railway operator who has made transportation his life's work, or the inexperienced motor bus operator to whom the problem is entirely new?

The answer I believe is obvious.

If service to the public is the first consideration as it ought to be, I think it is of the utmost importance that the electric railway and the motor bus service be coordinated. This hardly can be brought about with separate companies operating each class of service and each operator looking upon the other as an "obsolete fossil" on the one hand or a "fly-by-night interloper" on the other.

Railways Best Fitted to Operate Buses

There can no longer be doubt in the mind of anyone that the motor coach has a place, and an important one, in our scheme of transportation. We may disagree in details as to its proper place, but in the end I believe it will be found that the experienced electric railway operators are the men best fitted to put the motor bus in the place where it can be used to the greatest advantage in the service of the public.

I do not expect that you will all agree with me on that point. I have noticed recently in articles written by bus salesmen that they think the bus manufacturers should cut loose from the electric railways in seeking a market for their product. They contend that the bus will never reach its full development while its use is confined largely to agencies whose chief interest is in electric railways and who adopt the bus only when forced to do so by public demand.

These spokesmen of the motor bus industry cite columns of figures to show that the number of buses operated by railways, electric and steam, is only a small fraction of the number operated by independent bus companies and that consequently the real market of the bus manufacturer is among the independents. I am firmly convinced, however, that the interests of the bus manufacturers and the electric railways are closely connected and that unregulated and irresponsible bus operation should be discouraged. Such operation is contrary to good public policy.

The transportation field is a broad one. It embraces many problems each of which may call for a different treatment. The problems are so diversified that what is applicable in one situation may be utterly impracticable in another, although the two situations are seemingly alike. The transportation problems of a nation are so vast and so complex that with all the available agents now at our command the public demand for transportation service never has been met fully in any country.

This public demand is growing year by year and will continue to grow indefinitely. As transportation companies engaged in serving the public, our business is to find ways of more nearly filling that demand, rather than indulge in foolish controversies over substituting motor coaches for electric railways or motor trucks for freight cars running on rails, steam and electric.

Portion of the N. C. & St. L. Motor Transit Co.'s Fleet Which Operates Between Cowan and Tracy City, Tenn.

Motor Transport News

A BILL providing for a tax per passenger seat on motor buses and a ton-mile tax on trucks is being prepared for early introduction in the state legislature of Indiana.

THE ILLINOIS COMMERCE COMMISSION held a hearing at Springfield, Ill., on June 21 on the application of the Alton Transportation Company for a number of certificates for bus lines aggregating 400 miles in length.

THE STATE LAW empowering the Texas Railroad Commission to regulate the inter-city bus lines in the state went into effect on June 15. On the preceding day, the commission met and organized a bus division, the personnel of which includes a director, a chief clerk, a reporter, a stenographer, a file clerk and a rate clerk.

THE FIRST BUS LINE of the Chesapeake & Ohio was recently placed in operation between Covington, Ky., and Stevens, a distance of 10 miles. The bus is being used for the transportation of employees between these points and is being operated by an independent bus company under contract with the C. & O. The charge to the C. & O. for this service is made on a mileage basis. Similar operations are contemplated at other points.

A NEW MOTOR BUS LINE between Denver, Colo., and Los Angeles, Calif., has been established by the Paradox lines, Denver, Colo. The motor buses which are being operated are of the parlor type, equipped with reclining chairs, and the scheduled time between Denver and Los Angeles is three days. These buses will run via Colorado Springs, Pueblo, Trinidad, Raton, N. M., Albuquerque, Williams, Ariz., Flagstaff and Needles, Calif.

THE PENNSYLVANIA has contracted with the United States Trucking Corporation for freight handling via motor vehicle and ferry between its Jersey City, N. J., freight terminal and inland stations in Lower Manhattan, N. Y., permitting also direct collection and delivery by contract between trader and the trucking company. The arrangement is similar to that made by other railroads in New York and the service supplants in part the handling of freight by car float through pier freight stations.

THE DENVER & INTERURBAN MOTOR COMPANY, a subsidiary of the Colorado & Southern has been granted authority by the Colorado Public Utilities Commission to operate a bus line between Denver, Colo., and Boulder. Two provisions of the order granting the certificate have been objected to by the motor company and a rehearing has been granted on them. One is that for a period of at least five years the Colorado & Southern must retain a controlling interest in the bus company, and the other, that the railway must make available $250,000 to be used by the bus company in the purchase of equipment. The Denver & Interurban Motor Company is the successor of the Denver & Interurban Railroad, a former Colorado & Southern subsidiary which has been abandoned.

Pickwick Stages System Expands

The issuance of equipment trust certificates by the Pickwick Stages System in the amount of $200,000 and the increase of its capital stock from $1,000,000 to $5,000,000 has been authorized by the Arizona Corporation Commission. The Pickwick Stages System now operates several thousand miles of line extending from El Paso, Tex., via Los Angeles and San Francisco to Seattle, Wash. The proceeds of the sale of the equipment notes will be used toward the purchase of $400,000 worth of new buses from its manufacturing subsidiary. The Pickwick Stages System plans to purchase 41 buses of the intercity type, of which 10 will have capacity for 14 passengers, 10 for 18 passengers, 11 for 22 passengers and 10 for 26 passengers.

Truck Permits Granted in Minnesota

Operating permits have been granted by the Railroad and Warehouse Commission of Minnesota to 32 companies operating 275 trucks over 1,500 miles of routes. In granting the permits, the commission set up a number of requirements which the truck lines must meet, these relating to public liability insurance, property damage insurance, cargo insurance, and including a rule that only licensed drivers will be permitted to operate the trucks. Two kinds of certificates were issued, the first applying to operators of trucks operating as common carriers between fixed termini and over regular routes, and the second to operators of trucks which, in addition to covering regular routes, handle also agricultural, dairy and other products on a contract basis. Seven certificates of the first type were issued and 25 of the second type.

Motor Transport in Denmark

A special committee of the Danish Parliament has recommended that 34 of a total of 40 proposed railway extensions previously approved by Parliament be abandoned and that construction be made provisional in the case of three others, according to Modern Transport (London). The reason given for this recommendation is the rapid growth of motor transport in the country during the last decade. The country has a mileage of 4,750 of good roads and the total motor buses in operation 18 months ago was approximately 800. Most of the operators are small concerns having but two or three buses.

The number of buses has increased more than 40 per cent in the past three years, but this form of transportation is said to have been somewhat opposed by the government authorities because of its competition with the state-owned railways. There was a considerable discussion in Parliament on the subject two years ago and a commission was appointed to make an investigation. Pending the report of this commission no new licenses for bus operation were granted. Of the larger buses used it is estimated that 40 to 50 per cent are of American manufacture.

I. C. C. to Report on Bus and Truck Investigation

The Interstate Commerce Commission expects to submit a report on motor transportation to Congress at the opening of the next regular session, the chairman of the commission, John J. Esch, has stated. The commission is still working on the report of its investigation of the operation of motor buses and motor trucks by, or in connection or competition with, common carriers subject to the interstate commerce act.

"When we started the investigation last spring it was our hope that we might conclude the matter so as to file our recommendations with the last session of Congress," Chairman Esch said, "but the hearings did not conclude until the 15th of November, and the carriers and all others in interest were permitted to have 30 days in which to file briefs. We also sent out questionnaires to all carriers subject to our jurisdiction, asking them to answer numerous questions with reference to motor transportation, and we have made public two statements of analysis of the returns to the questionnaire. It was a physical impossibility for us to get ready a report for the last session. The hearings held last summer and fall covered the entire country and made a record of over 5,000 pages. Over 400 witnesses appeared before us, presenting over 400 exhibits. We expect to be able to file our recommendations for consideration by the next Congress."

Highway Competition in Sweden

The Swedish railways are taking steps to meet truck competition, after having lost 70 per cent of their l. c. l. freight business, according to Consul-General Osborne at Stockholm. A general decrease in the freight rates is considered absolutely necessary and the problem at present is to decide the amount of reduction, so that direct losses will not be the result. It is further desired that the privately owned railroads make the same reductions as the state railroads, so that co-operation between the two may be assured. Supplementary steps, such as having light freight trains running several times a day on the routes where the truck competition is most severe, simplifying the formalities for delivering and receiving freight, reducing the fees for storage in the railroads' warehouses, etc., are also being considered.

At the continuation of the conference between representatives of the Swedish railways and the motor vehicle interests, says

Modern Transport (London), it was stated that 4,000 buses are now in service in Sweden on 1,400 routes with a total length of 35,000 kilometers, while the total length of the Swedish railways is only 16,000 kilometers. There are only 3,500 railway stations, but on the omnibus routes there are at least 20,000 ordinary stopping places. Thirty-four private railways have started their own motor services.

The discussions have continued along two lines, the spokesmen for motor vehicle interests emphasizing the value of buses to the public owing to their easier accommodation to local requirements, and the railway interests emphasizing the necessity of measures to make it possible for the railways to exist in spite of the increasing motor traffic.

In some quarters it has been proposed that the railways should have preferential rights to open new bus routes affecting the railway lines and that the bus companies should contribute more largely to the upkeep of the roads. The railway representatives also ask for a mitigation of regulations so that operating costs can be reduced. No definite proposal for collaboration between the railways and the motor services (in any other form than that of motor traffic being carried on by the railways themselves) was submitted to the conference, which terminated without any resolution having been passed.

State and Local Governments Allowed to Tax Interstate Bus Operators

The right of states and local governments to tax interstate motor bus operations has been affirmed by the United States Supreme Court (Clark et al. vs. Public Utilities Commission of Ohio). The plaintiff Clark who operates buses in exclusively interstate commerce between Ohio and Indiana sought to enjoin the Ohio commission from enforcing the Ohio law which requires each prospective operator to secure a certificate of convenience and necessity and to pay a tax varying with the number of units operated and their capacity. Quoting from the decision:

"It appeared that while the act calls the certificate one of 'public convenience and necessity,' the commission had recognized, before this suit was begun, that, under Buck v. Kuykendall, and Bush v. Maloy, it had no discretion where the carrier was engaged exclusively in interstate commerce, and was willing to grant to plaintiffs a certificate upon application and compliance with other provisions of the law. * * * The highways are public property. Users of them, although engaged exclusively in interstate commerce, are subject to regulation by the state to insure safety and convenience and the conservation of the highways. Morris v. Duby, No. 372, decided April 18, 1927.

"Users of them, although engaged exclusively in interstate commerce, may be required to contribute to their cost and upkeep. Common carriers for hire, who make the highways their place of business, may properly be charged an extra tax for such use. * * *

"There is no suggestion that the tax discriminates against interstate commerce. Nor is it suggested that the tax is so large as to obstruct interstate commerce.

"It is said that all of the tax is not used for maintenance and repair of the highways; that some of it is used for defraying the expenses of the commission in the administration or enforcement of the act; and some for other purposes. This, if true, is immaterial.

"Since the tax is assessed for a proper purpose and is not objectionable in amount, the use to which the proceeds are put is not a matter which concerns the plaintiffs."

Likewise in the District Court for Eastern Pennsylvania the right of the City of Philadelphia to collect a $50 license fee per vehicle using the streets of Philadelphia was affirmed.

Equipment

THE DENVER-COLORADO SPRINGS-PUEBLO MOTOR WAY, INC., bus operating subsidiary of the Colorado & Southern and the Denver & Rio Grande Western, has received from the International Motor Company two six-cylinder 26-passenger Mack parlor car buses.

Motor Transport Officers

Carl Beach has been appointed superintendent of the Union Pacific Stages with headquarters at Pendleton, Ore.

Among the Manufacturers

The White Company, Cleveland, Ohio, has announced the appointment of new managers for six district and branch offices, as follows: **R. W. Moore,** district manager, Portland, Ore.; **R. M. Miller,** branch manager, Oakland, Cal.; **S. S. Warner,** district manager, Toledo, Ohio; **W. J. Miller,** branch manager, Harrisburg, Pa.; **C. G. Richardson,** branch manager, Montreal, Que.; and **C. J. O'Brien,** branch manager, Winnipeg, Man.

James R. Fitzpatrick has been appointed vice-president of the **Haskelite Manufacturing Corporation.** He continues as secretary and member of the board of directors. He also continues in charge of sales. Mr. Fitzpatrick has been with the Haskelite Manufacturing Corporation since a few months following its organization in 1917, and has served it in all capacities from factory manager to purchasing agent and sales maneger and also as an executive. He is a graduate in civil engineering of Rensselaer Polytechnic Institute.

Carl Abell, who has for the past year been advertising manager of the **American Car & Foundry Motors Company,** has been transferred to the Pacific Coast sales force of the same company. He will be succeeded by **James J. McMahon,** formerly of the sales promotion department of the International Motor Company, who has been identified with the motor bus industry for the past four years and has had several years of experience in the retail automobile field prior to his connection with the bus industry.

J. A. Morris, for many years identified with the sale of Mack trucks for the International Motor Company, has joined the **Autocar Company's** factory organization as assistant sales manager. Mr. Morris will be the traveling executive in charge of dealers and dealer sales. He has been identified with the motor truck industry since 1911, when he joined the International Motor Company's organization as a salesman. In 1912 he became the Mack district manager at New Haven, Conn., and in 1913 he went into business for himself as distributor of Mack trucks, opening branches of his own business at Bridgeport, Conn., New Haven, Hartford, New London, and Waterbury, and Springfield, Mass. In 1919, Mr. Morris sold this business to Mack Trucks, Inc., and operated it for them for about one year. In 1920, he was transferred to the New York office, and since 1922 he has been in business for himself.

Bernard Allen, assistant engineer of the bureau of economics of the Canadian National, at Montreal, Que., has resigned that position to become affiliated with the Scarr Transportation Service, railway and highway consulting engineers, New York. Mr. Allen was born at Kentville, Nova Scotia, September 6, 1887. He received the degree of Bachelor of Applied Science at the University of New Brunswick in 1913. After eight years in construction work with the Canadian Pacific, the Dominion Atlantic, the Canadian Government Department of Railways & Canals and the St. John Dry Dock & Shipbuilding Company, and three years with the Grand Trunk Arbitration Staff in special analysis, Mr. Allen entered the service of the Canadian National as assistant engineer, bureau of economics, in April, 1924. From that time until his resignation, Mr. Allen was engaged in surveys of a varied nature, specializing during the past two years on highway transportation. He was a representative of the C. N. R. in the Motor Transport Conference.

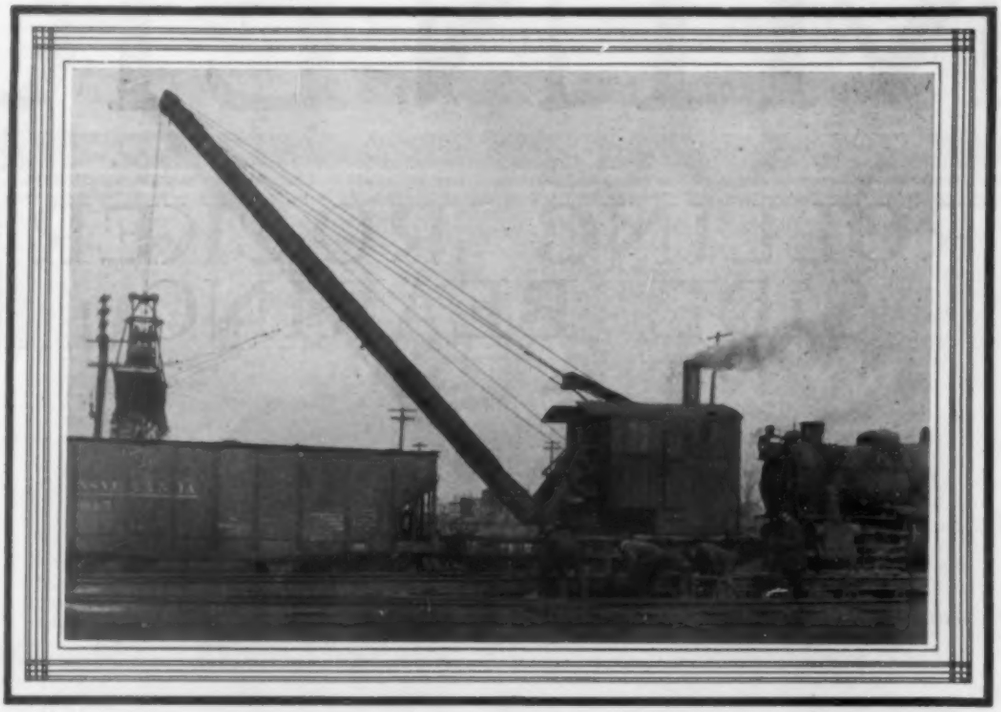
B. Allen

MINER

ROLLING ROCKER SIDE BEARING

THIS STURDY BEARING INSURES FREE PIVOTING OF CAR TRUCKS, REDUCES WHEEL WEAR, TRAIN RESISTANCE AND INCREASES FUEL EFFICIENCY

W.H.MINER INC. CHICAGO



THE KEYSTONE

OF SUCCESSFUL RAILROADING

THE proper maintenance of *your* rights of way can aptly be termed the keystone of your success. Just as all units of an arch are dependent upon the *keystone* for support, all units of your road are dependent upon your rights of way.

To insure proper maintenance your maintenance departments should have up-to-date equipment. INDUSTRIAL maintenance of way cranes are the fastest and most economical cranes on the market. They possess every modern improvement known to the locomotive crane industry and more than that, they have quality materials and expert design exclusively INDUSTRIAL.

For ballast cleaning service the INDUSTRIAL tapered-end maintenance of way crane will give the best results with no cause for slowing up traffic on adjacent tracks. Patented stops prevent the rear end of the crane from swinging into the operating clearance of adjoining tracks.

For clearing landslides, widening cuts, making new ones, leveling grades and general maintenance of way work, the INDUSTRIAL hi-speed locomotive ditcher has no equal.

For general work and other maintenance of way service our standard line of seventeen types of locomotive cranes varying in capacity up to 200 tons, furnishes a selection amply varied to meet any demand.

Write for further information

INDUSTRIAL WORKS, BAY CITY, MICHIGAN

BRANCHES

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Hurt Bldg.

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Detroit, Mich.
Book Building

New Orleans, Louisiana
Whitney Central Bldg.

New York City
50 Church St.

Philadelphia, Pa.
Packard Building

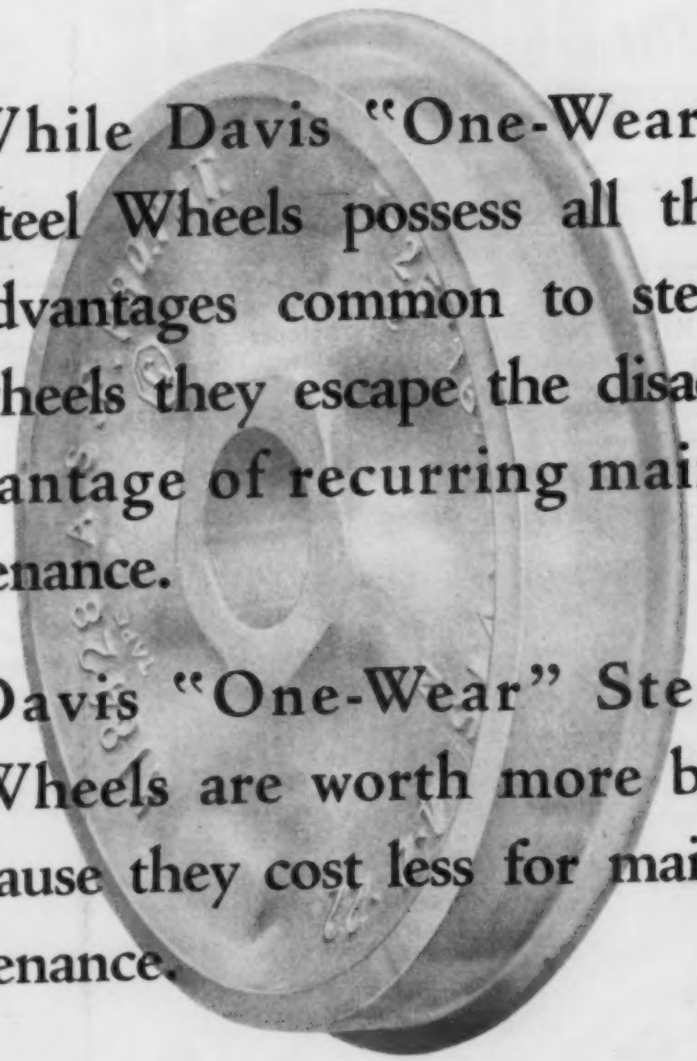
Pittsburgh, Pennsylvania
Federal Reserve Bldg.

San Francisco, Calif.
Monadnock Bldg.

St. Louis, Mo.
Railway Exchange

Tampa, Florida
823 S. Oregon Ave.

An Unmixed Blessing



While Davis "One-Wear" Steel Wheels possess all the advantages common to steel wheels they escape the disadvantage of recurring maintenance.

Davis "One-Wear" Steel Wheels are worth more because they cost less for maintenance.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

SAFETY ELECTRIC FANS

For Beauty

For Utility

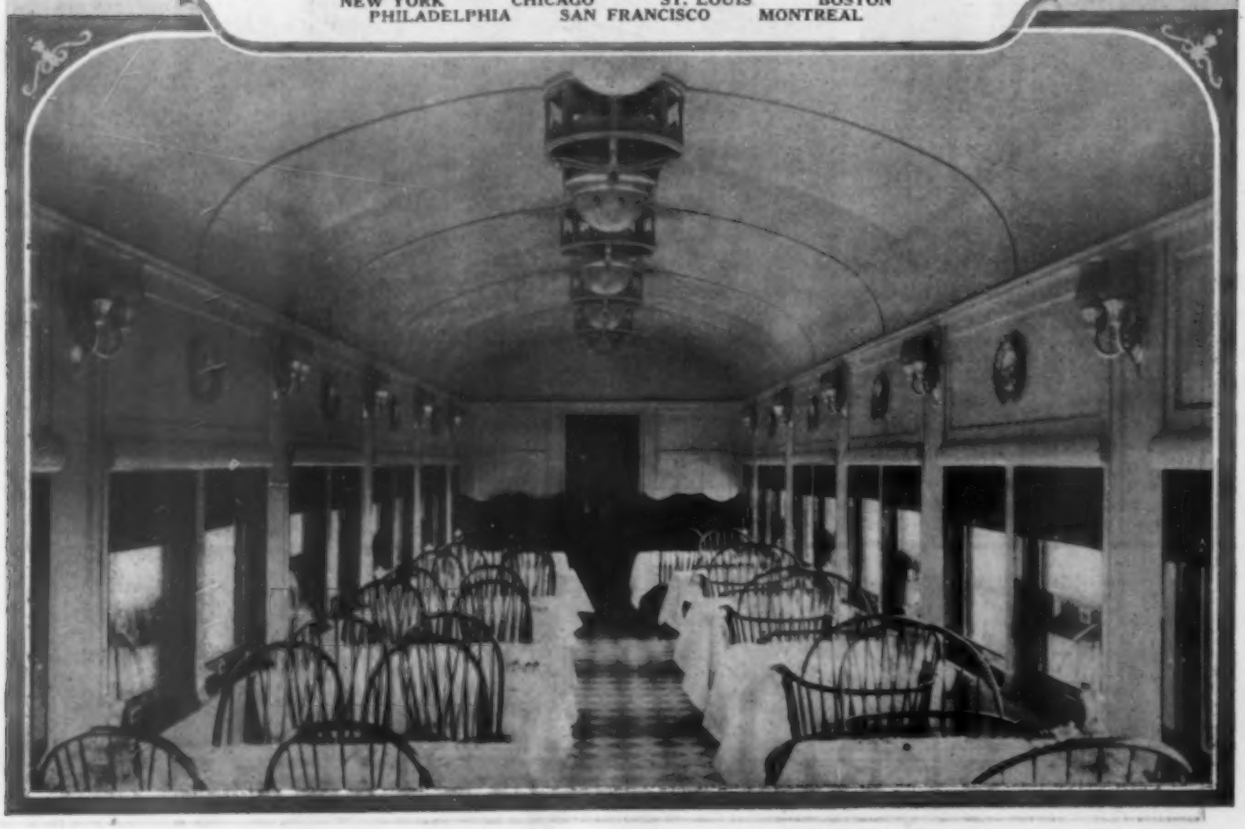
SAFETY Railway Service Fans combine beauty and utility—they are decorative as well as useful. These fans are designed and built specifically for railway service, and represent knowledge gained in 35 years of intimate contact with railway conditions and practices.

A proper car equipment of Safety Ceiling Fans creates uniform, healthful, comfortable air circulation throughout the car interior.

Interchangeability of parts has been developed to the highest degree resulting in quick and easy repair with minimum stock of replacement parts.

The Safety Car Heating and Lighting Co.

NEW YORK CHICAGO ST. LOUIS BOSTON
PHILADELPHIA SAN FRANCISCO MONTREAL



VIBRATION - SHOCK - WEAR
can't loosen them

HY-CROME is steadily changing the spring washer policy of many railroads. Their proven performance under all service conditions is in direct line with the present trend of lowering maintenance cost by raising the standard of operating efficiency.

Hy-Crome Spring Washers give permanent rail joint security. Vibration, shock or wear can't loosen them because they embody to an excess degree the necessary non-fatiguing spring action that constantly resists these destructive forces—and yet Hy-Crome possess "just enough tension" to allow perfect freedom of rail movement, the greatest known preventive against battered rail ends, sheered off bolts, damaged fish plates and the costly item of frequently replacing these.

You can get "Heavy Duty," "Deflected" or just "Standard" Hy-Crome but if you want consistent economy, be sure that it's Hy-Crome you get.

THE RELIANCE MFG. CO.
MASSILON, OHIO

NEW YORK, CLEVELAND ST. LOUIS, DETROIT, SAN FRANCISCO, CHICAGO,

N. S. Kenney, Munsey Bldg., Baltimore, Md.
W. & A. C. Semple, Louisville, Ky.
Engineering Materials, Ltd., McGill Bldg., Montreal, Quebec, Canada

HY-CROME
SPRING WASHERS

CRANE

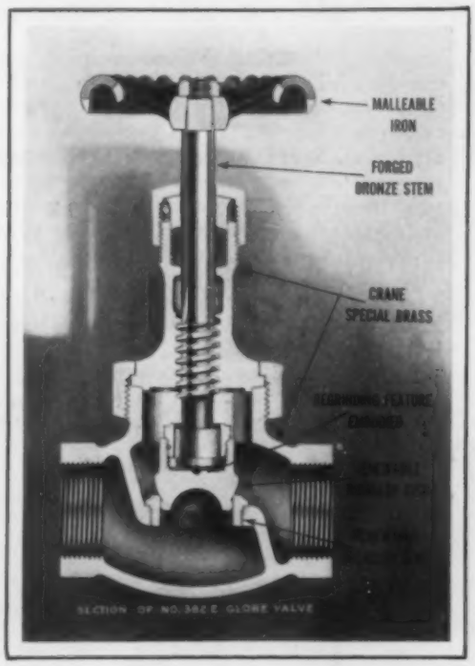
LOCOMOTIVE CAB VALVES

300 POUNDS STEAM WORKING PRESSURE

No. 1822

No. 1826

No. 1824



No. 1827

No. 1825

No. 1823

DEPENDABLE VALVES FOR RAILWAY USE

Because they are made to withstand the severe service of throttling on lines where there is danger of wire drawing, the new 382 E Globe valve and other valves here shown excel for use on water glass and water bottle drains and for use on locomotive and roundhouse blowers.

They have renewable *Nicalloy* disc and seat rings, deep packing boxes, and gland followers. Discs are of swivel type, screwed and pinned as shown in the sectional view.

These valves are made for steam working pressures and temperatures as used in the modern locomotive. They are recommended for service up to their ratings where other valves have failed. All the above valves are of the same construction as shown in the sectional view.

Crane makes valves to handle any working pressures or temperatures. See the Crane Exhibit at the air brake convention in Washington, D. C.

CRANE

Address all inquiries to Crane Co., Chicago

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVENUE, CHICAGO

Branches and Sales Offices in One Hundred and Fifty-five Cities

National Exhibit Rooms: Chicago, New York, Atlantic City, San Francisco, and Montreal

Works: Chicago, Bridgeport, Birmingham, Chattanooga, Trenton, Montreal, and St. Johns, Que.

CRANE EXPORT CORPORATION: NEW YORK, SAN FRANCISCO, MEXICO CITY, HAVANA

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CRANE-BENNETT, LTD., LONDON

CIE CRANE: PARIS, BRUSSELS

Lumber for RAILROADS

Forty-eight Hours Dispatch on Timbers any size and length up to 42 feet

Rough or Dressed

Durable Douglas Fir Timbers of Uniform Compact Texture

Bridge Timbers, Ties, Car Material, Grain Doors, and General Construction Material

CENTRAL COAL AND COKE COMPANY

Let Us Quote on Your Requirements!

Address Inquiries to Our General Offices:
KANSAS CITY, MO.

UPSON BOLTS

always insure better car construction

UPSON Bolts are made from various grades of steel, a special purpose steel that time and experience has proven best suited to do a specific work unfailingly.

Through every stage of manufacture "from the ore to the finished product" the performance qualities of Upson Bolts are continually tested, tried and checked assuring their better service for the intended purpose.

Each Upson Bolt is uniformly perfect in material structure, size and finish. These added features of real bolt value are made possible through Upson reputation resulting in volume sales which in turn has lead to mass production and the development of the most improved bolt making machines in use.

Upson bolts mean better car construction, longer service life, lower maintenance—they stand for bolt satisfaction and bolt economy in its fullest sense.

BOLTS AND NUTS FOR EVERY PURPOSE

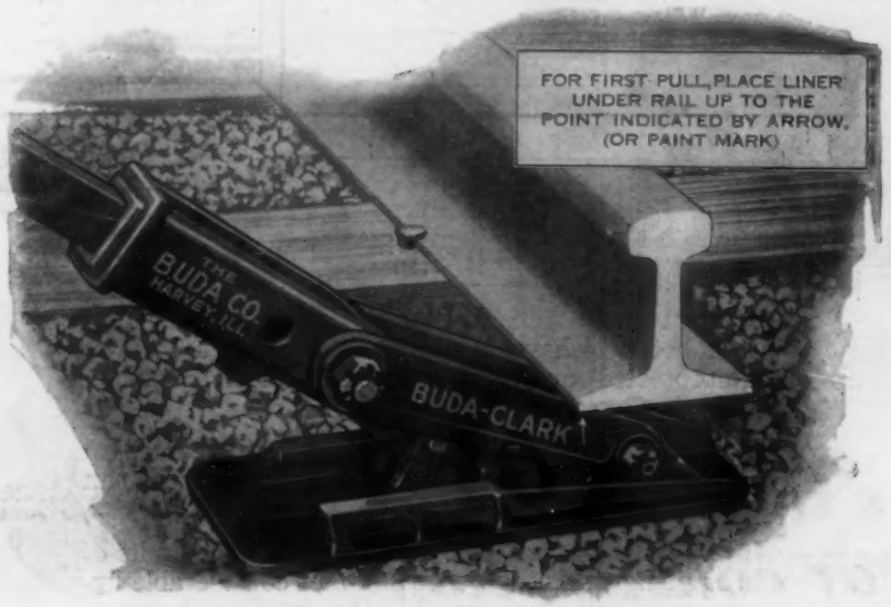
THE BOURNE-FULLER CO.
CLEVELAND, OHIO
Makers of "Upson Bolts" - The Result of Over 70 Years Specialization

BUDA
ESTABLISHED 1881

Buda-Clark Track Liner

Most Work With Least Effort

Only two liners required



Slides the track without lifting it.

Lines track in any ballast.

Easily handled—Weight 28 pounds.

Special tools unnecessary — the square socket fits standard lining bar.

Flat base without lugs makes liner easy to place in position.

An important feature is the small amount of lift necessary before the transverse movement takes place.

The movement comes from a lift on the lining bar, which is always more effective than a downward pull.

Send for complete catalog

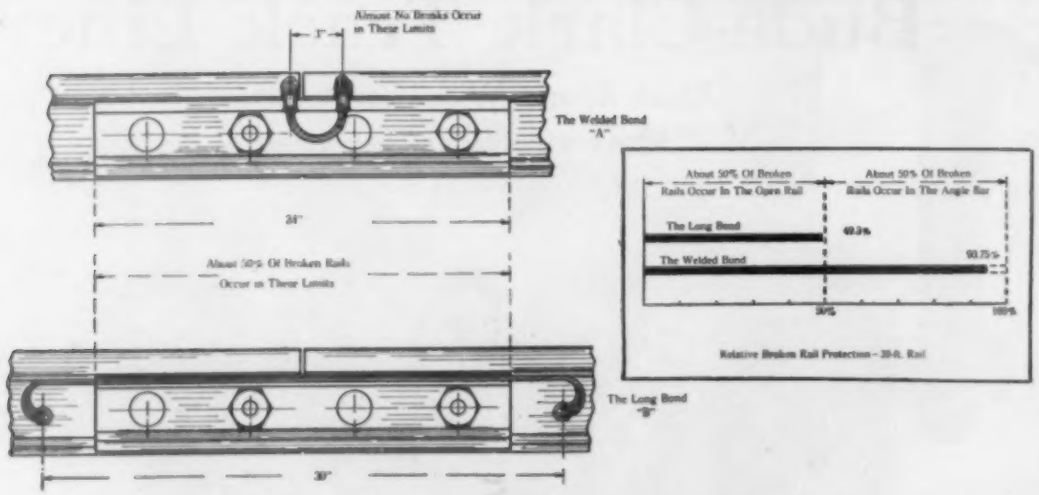
The Largest Manufacturer of the Most Complete Line of Railroad Materials and Track Supplies

THE BUDA COMPANY

HARVEY (CHICAGO SUBURB) ILLINOIS

NEW YORK. CHICAGO. ST. LOUIS. ATLANTA. SAN FRANCISCO. LONDON

3 inches or 30 inches UNPROTECTED?



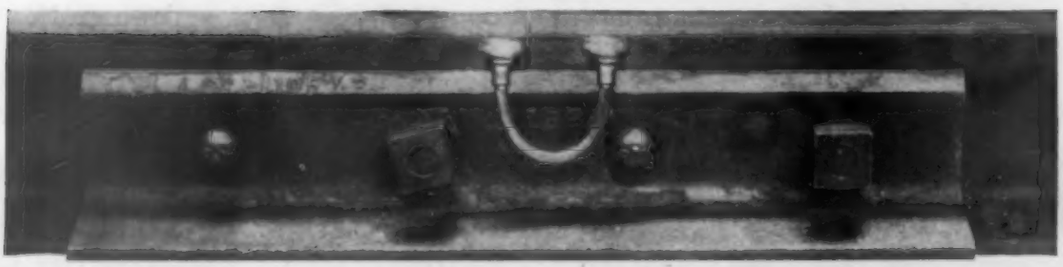
IS IT better to have *3 inches* of each length of rail unprotected or *30 inches* unprotected, signally, against broken rail?

That is the relation of O-B welded bond (3-inch span) broken rail protection to that of long bonds which span the angle bars (30 inches).

With 50% of rail breaks occurring within the limits of the angle bar, this difference assumes considerable importance as will be observed in the sketches above.

It is the difference between 93.75% and 49.2% assurance that broken rails will be discovered through signal indication caused by increased track circuit resistance.

Ohio Brass Company, Mansfield, Ohio
Dominion Insulator & Mfg. Co., Limited
Niagara Falls, Canada
3078



SIGNAL SAFETY WITH O-B BONDS

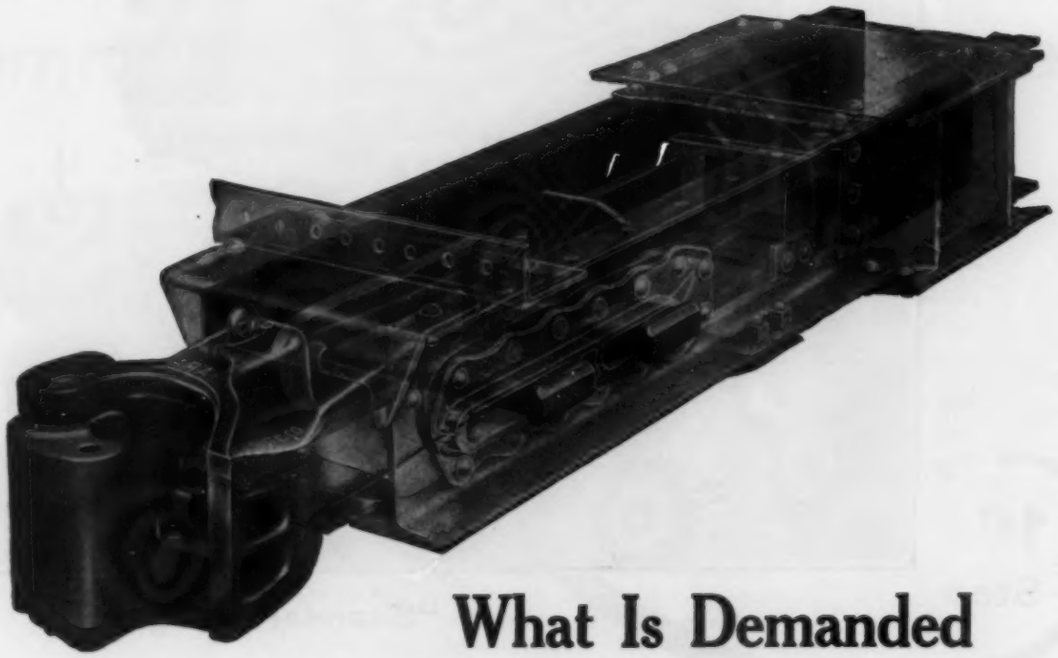
Ohio Brass Co.

SALES OFFICES: NEW YORK CHICAGO PHILADELPHIA PITTSBURGH CLEVELAND SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

FARLOW

DRAFT ATTACHMENT



What Is Demanded Of Draft Attachments?

1. They must securely harness the draft gear and coupler to the car. This means safety.

2. They must distribute all loads in excess of the cushioning capacity of the draft gear so as to avoid destructive concentrated loading of the draft gear and car sills. This means economy.

These combined qualities are found only in Farlow Draft Attachments.

THE SYMINGTON COMPANY

Farlow Draft Gear Attachments Gould Automatic Brake-Slack Adjuster Malleable Iron Journal Boxes

New York Chicago Baltimore Boston Montreal

WORKS: ROCHESTER, N. Y.

. . Processes Essential in the Man

1st Step

"Standard" Ingots

We make our own steel to assure the absolute control of quality in our forgings.

"STANDARD" STEEL HIGH—

ufacture of High Duty Forgings..

[No. 1 in a Series]

Quality in Forgings *Must* Commence with Quality in Steel

IF care and knowledge are not used in making steel ingots, neither knowledge, care nor equipment can possibly make up for this deficiency in subsequent processes.

"Standard" Steel procedure, therefore, does not start at any later stage in forging manufacture. It commences with the testing and selection of *raw materials*, varying and controlling these materials in the manner best suited to the work in hand, and proceeding with production of our own steel ingots in our own open hearth furnaces.

This is but the first of our requirements—one of several reasons why "Standard" Steel Forgings are the outstanding products in this field. Write for complete data on preliminary processes and latest practice in production of high duty locomotive forgings.

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES

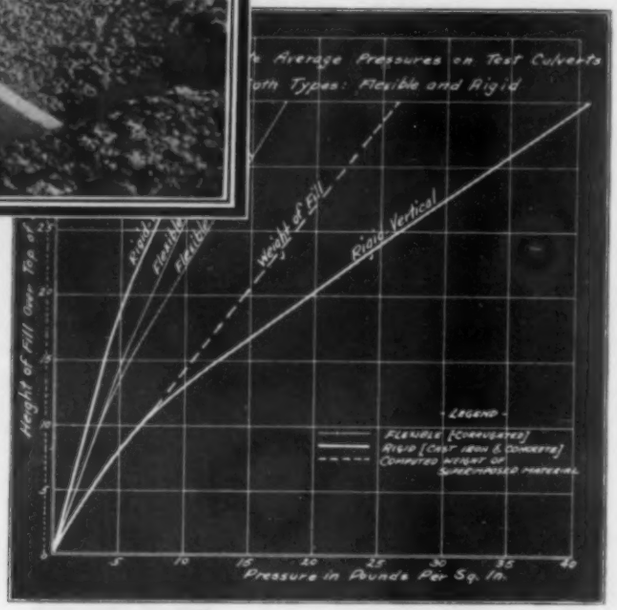
CHICAGO ST. LOUIS NEW YORK HOUSTON PORTLAND RICHMOND SAN FRANCISCO ST. PAUL PITTSBURGH MEXICO CITY

WORKS: BURNHAM, PA.

H—DUTY LOCOMOTIVE FORGINGS

Proved~

ARMCO Culverts are stronger because they change vertical loads to a practically even load over the entire circumference. This is why ARMCO Culverts endure under loads of fill and traffic that would crack and crush rigid materials.



~by time

~by test

ARMCO

Predominant in use - - -

Let **Armco's** *Proven Strength Carry Your Traffic*

TO avoid heavy upkeep expense culverts must have strength to resist both weight of fill and impact of traffic. Culverts are being buried away in the ground, out of sight, even forgotten. Yet road upkeep and maintenance depends on their effective operation for they are guardians of the road foundations.

So engineers are carefully investigating culvert materials to make certain they can endure the loads and strains of culvert service. Thousands of veteran ARMCO Culverts have proved ARMCO has this strength—some of them under fills up to eighty feet in depth and subject to the heaviest main line traffic loads. For a generation these pipes have been giving perfect service without breakage or other damage—without upkeep expense.

Now this tremendous strength in service is explained through an exhaustive test by the A. R. E. A. at Farina, Illinois. This test shows ARMCO Culverts are stronger because they distribute loads over the entire culvert circumference. They endure because they use *all of the strength of the culvert.*

Every engineer interested in culvert economy and durability (particularly in heavy load service) should have the facts developed by this test. They are yours for the asking.

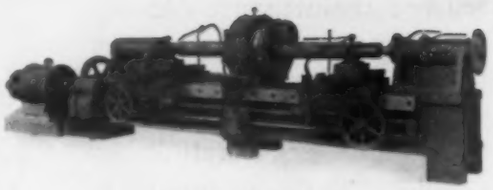
ARMCO CULVERT MANUFACTURERS' ASSOCIATION
MIDDLETOWN, OHIO

CULVERTS

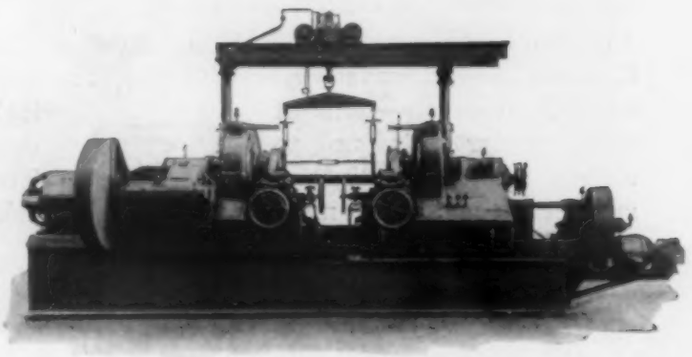
because predominant in quality

Sellers

Locomotive Driving Box Boring Machine



Car Axle Lathe



42-inch Car Wheel Lathe

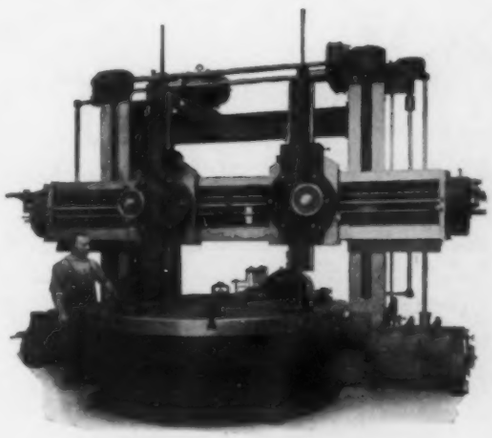
A FEW outstanding examples of Sellers concentration on railroad shop equipment.

The reason these machines have found such favor in the largest and most up-to-date shops throughout the country is that they have won approval on a production basis.

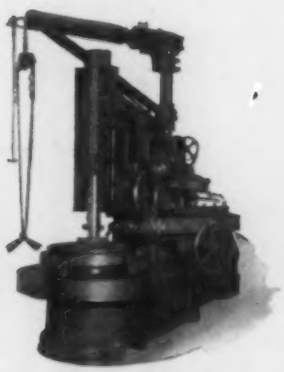
Our engineers will be glad to consult with you on production problems at any time.

WILLIAM SELLERS & CO.
INCORPORATED
Philadelphia, U.S.A.

R.R. Shop Equipment

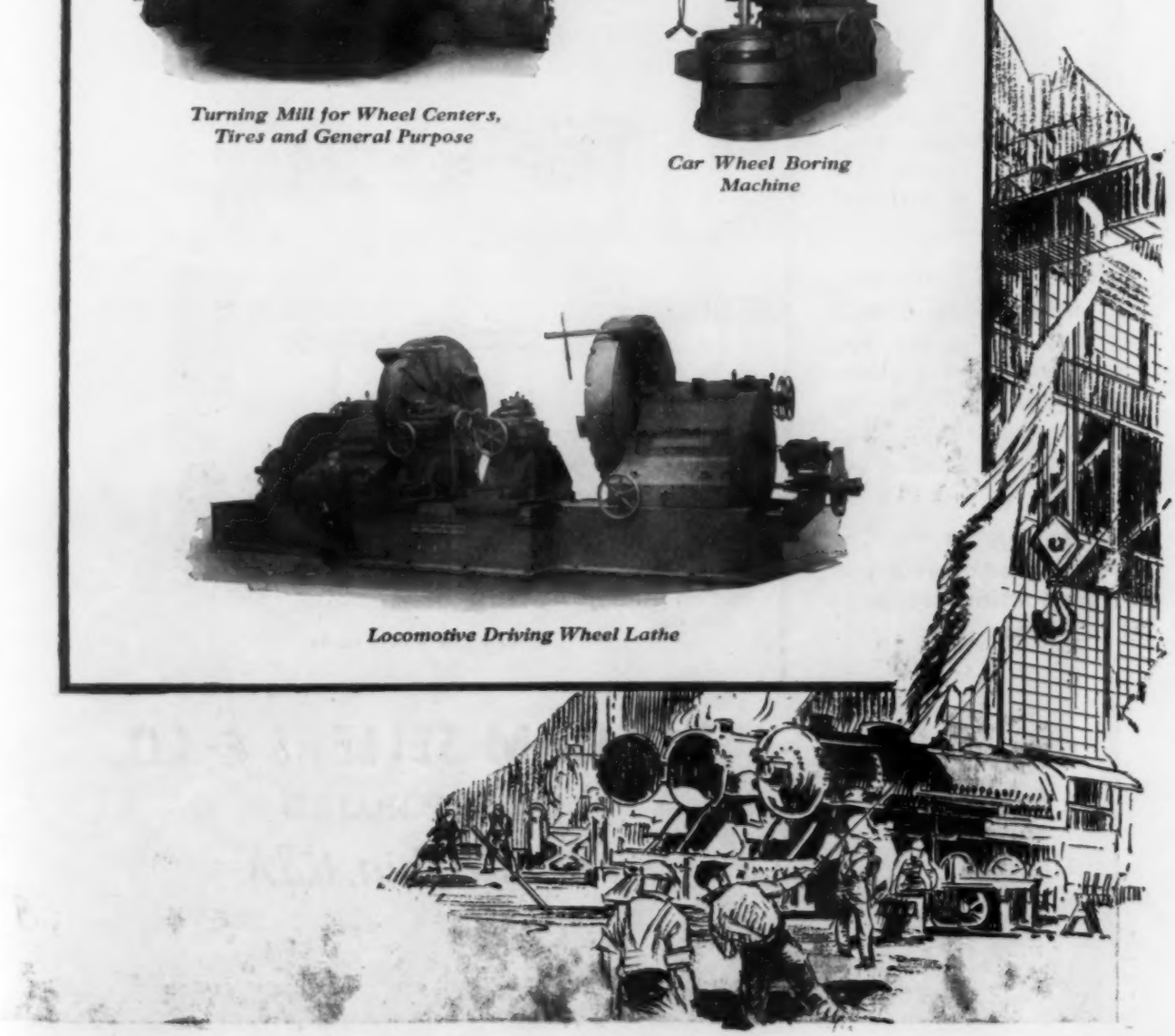


Turning Mill for Wheel Centers, Tires and General Purpose

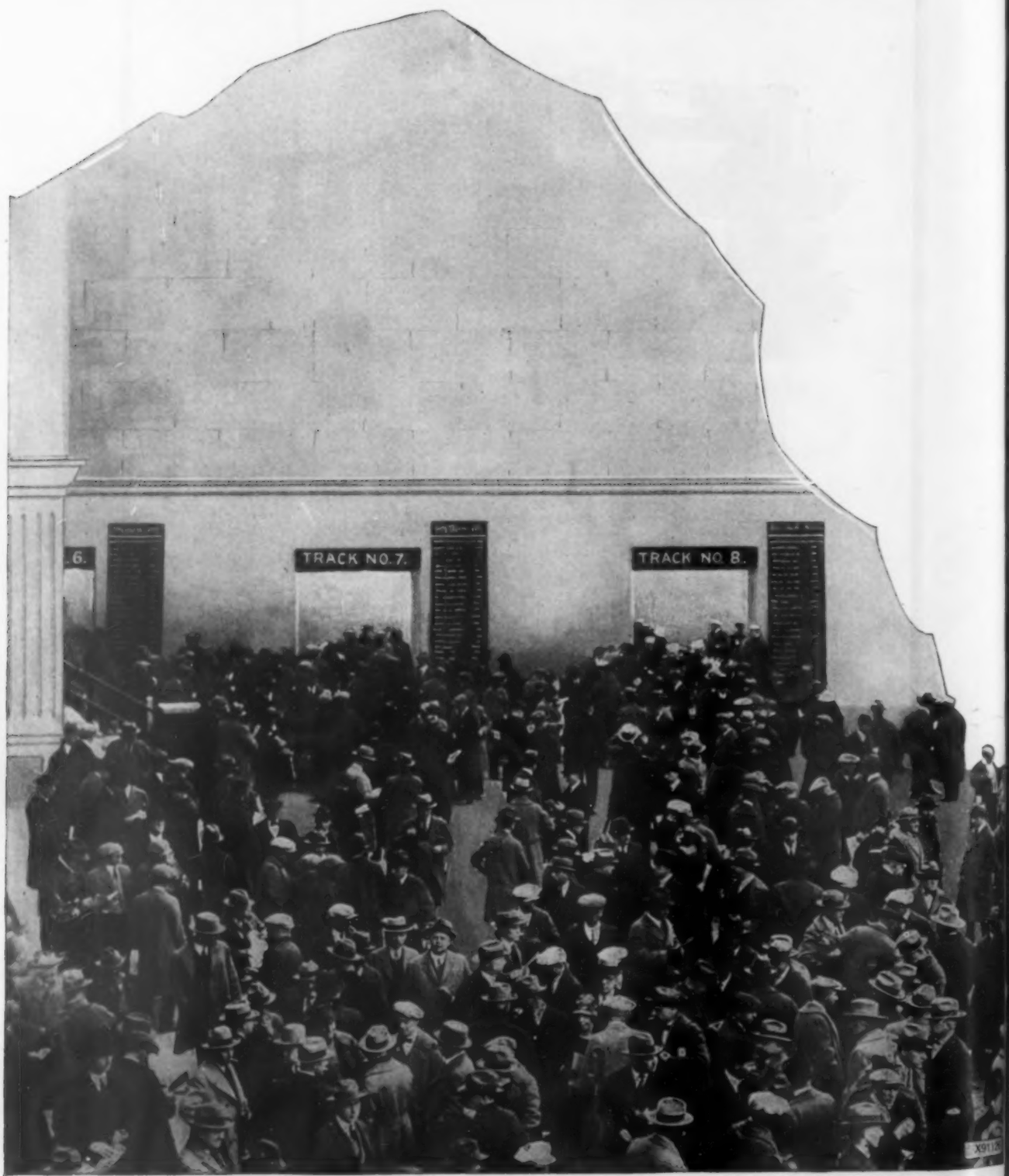


Car Wheel Boring Machine

Locomotive Driving Wheel Lathe



Is Transportation



Keeping Pace?

THE earlier advancement of civilization was almost wholly dependent on communication and transportation. Undeveloped countries yielded their natural resources only as transportation made the countries accessible.

To railroad men of vision and pioneering spirit belongs the initial credit. To men of genius belongs the task of keeping transportation in step with the rapid progress of industry and the higher social order.

For industry has brought to the people at large comforts and conveniences and luxuries at one time denied to even the wealthiest.

Electricity has been a mighty factor—both in manufacture and in the home.

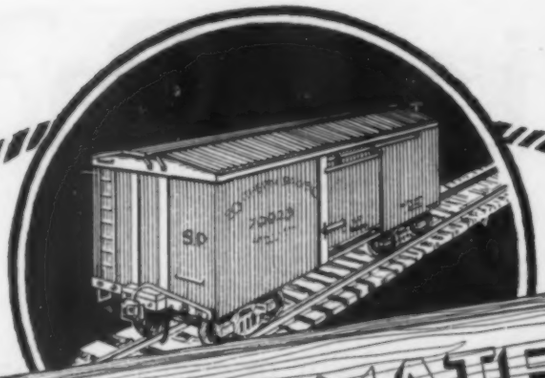
Logically, and naturally, electricity is rapidly finding its practical application in the field of transportation—for this is a field that directly affects the people, and in which progress depends on profitable operation. There are enough examples of profitable operation to prove the practicability of electrically-operated lines for railroads.

What is more obvious than that this agent, electricity, should be used extensively in railroad work to obtain greater efficiency and reliability. Where the advance in transportation is the greatest, the greatest achievements will result.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in all Principal Cities of
the United States and Foreign Countries

Westinghouse

X91127



CAR BUILDING MATERIALS

Sills — Framing — Siding — Lining — Roofing

—of the qualities demanded by the master car builders for superior car construction purposes, link our operations with the requirements of modern railroading.

These items are our specialties, products in which we maintain a high, unvarying standard of "quality." Manufactured from select Durable Douglas Fir, uniformly milled and carefully and correctly finished, each piece denotes expertness in lumber manufacture. Here then, is the ultimate economy in construction costs, durability and complete satisfaction; qualifications available only in "quality" car-building materials.

Specifications submitted to us are handled with care and prompt despatch—a "service" worthy of our "quality."

Duncan Lumber Company

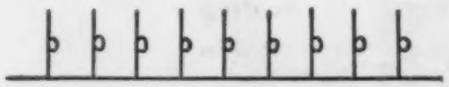
SALES REPRESENTATIVE CHICAGO (McCORMICK BLDG)

Portland, Oregon

SAWMILLS AT DRYAD, WASH

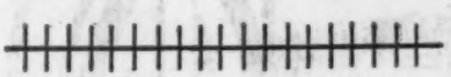
From cross-arm to track—Durable Douglas Fir

WHEREVER a softwood can be used in railway construction, Douglas Fir will be found to meet all requirements—to comply with all the A. R. E. A. grade combinations and all Mechanical Division requirements—ON GRADE—at a reasonable price—in unlimited quantities. Cross-arms, poles, ties, trusses, buildings and box cars all



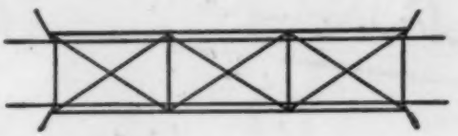
make different demands on a wood, but none demand of Douglas Fir that which it cannot furnish from its unique combination of properties.

Take two such different items as cross-arms and cross-ties, for instance. Each must be durable, but under different conditions. If of Douglas Fir, both will be practically *all heartwood*—and both

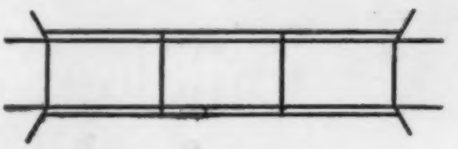


can be *all* heartwood—amply durable without protection—more durable if creosoted. Strength for safety of linemen is important in the cross-arm, and you get it with Douglas Fir. Long service is *imperative* in the cross-tie—and inherent in Douglas Fir.

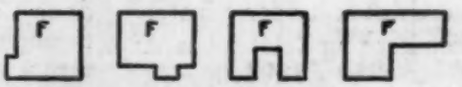
Heavy construction will require big timbers—no other tree can furnish such big sticks—*all heartwood*, if necessary. Car decks and platforms call for strength, durability and wear-resistance



—you get them in Douglas Fir. Car siding and buildings may need clear lumber—again it is easy to get these qualities in this choice West Coast wood.



We will be glad to send you a list of our member mills, from whom you can obtain quotations. Our technical department is ready at all times to furnish

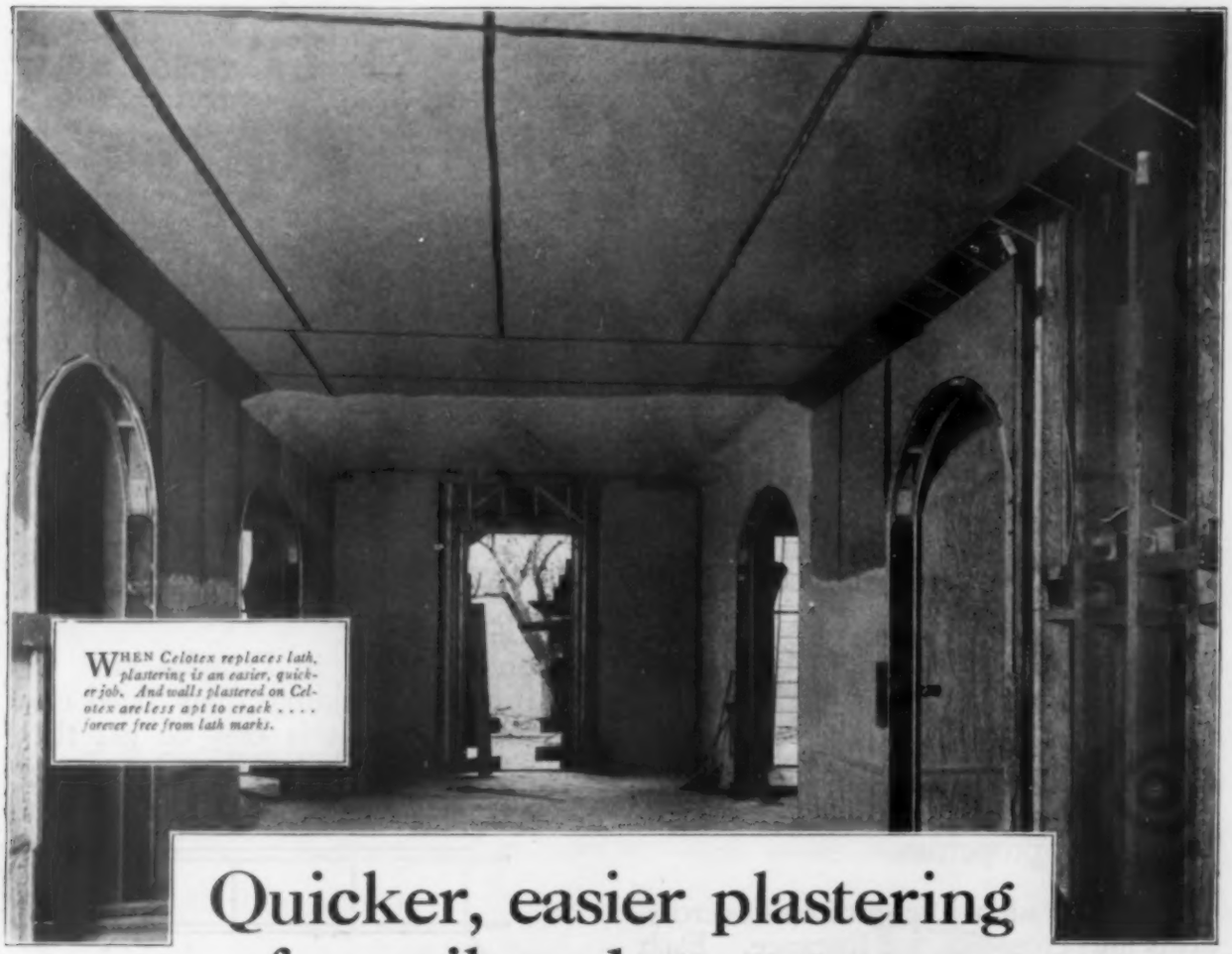


engineering data on railway uses of Douglas Fir. *Address,* West Coast Lumber Bureau, 5562 M Stuart Building, Seattle, Washington.

Durable
Douglas Fir
America's Permanent Lumber Supply

W57R

Important West Coast Woods—Douglas Fir - West Coast (Sitka) Spruce - West Coast Hemlock - Western Red Cedar


WHEN Celotex replaces lath, plastering is an easier, quicker job. And walls plastered on Celotex are less apt to crack .... forever free from lath marks.

Quicker, easier plastering for railroad structures

Fewer cracks, no lath marks, less plaster needed when Celotex replaces lath

FASTER work and a finer finish are the immediate results of using Celotex under plaster.

Broad, strong Celotex boards (4′ wide, 8′ to 12′ long, 7/16″ thick) are applied much quicker than narrow wood lath. And the tough cane fibres in the surface of Celotex grip plaster with wiry fingers. This tight bond is one reason why a Celotex wall is less apt to crack . . . another reason is that Celotex boards brace the whole wall stronger than lath.

Plaster spreads on Celotex easily, because the ground coat does not have to be forced through to key. This saves plaster as well as labor . . . reduces the amount of plaster needed about one-third. Besides these practical advantages, Celotex provides effective protection against extremes of heat and cold; makes buildings more comfortable all year 'round.

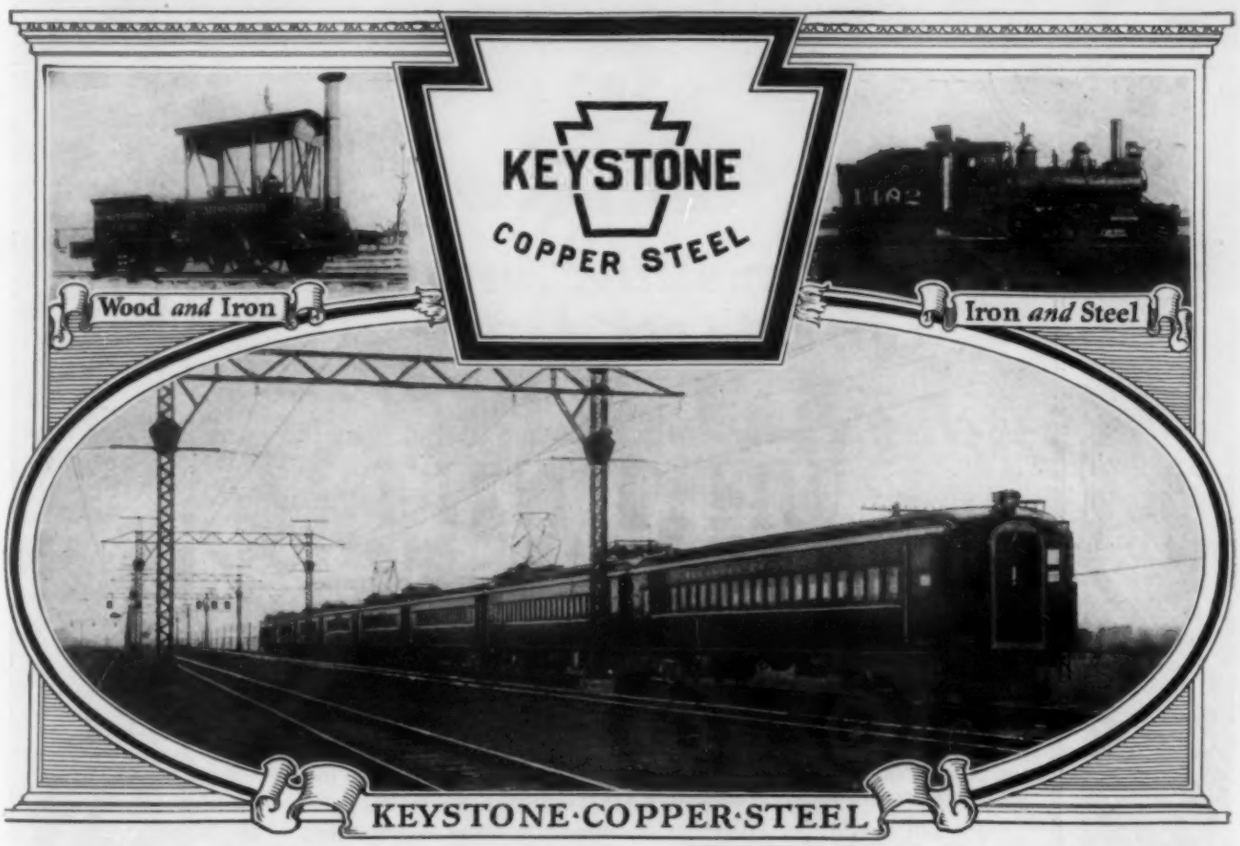
There are many other railroad uses for Celotex. Used for floor, wall or roof insulation, as interior finish, as exterior finish, as sheathing, Celotex cuts building costs, increases comfort and saves fuel. In one source of supply, with one overhead, Celotex gives railroads a material of wide use, easy to handle and always economical. Many of America's leading railroads carry Celotex in their store rooms as a standard material.

Our Railroad Department will co-operate with your building department in lowering building costs. For full information address The Celotex Company, Chicago, Ill. Mills: New Orleans, La. Branch Sales Office: 101 Park Ave., New York.

CELOTEX
INSULATING LUMBER

KEYSTONE COPPER STEEL

THE EVOLUTION OF Equipment and Materials



The Illinois Central Railroad recently inaugurated electrified suburban service in the Chicago District. Every coach in the new equipment was constructed of KEYSTONE COPPER STEEL Sheets. This selection was made by their engineering staff after careful and thorough investigation.

Wherever permanence of construction is of importance, KEYSTONE quality Black and Galvanized Sheets, Tin and Terne Plates, will give the user maximum service and satisfaction. Send for booklet showing proof of superiority.

American Sheet and Tin Plate Company

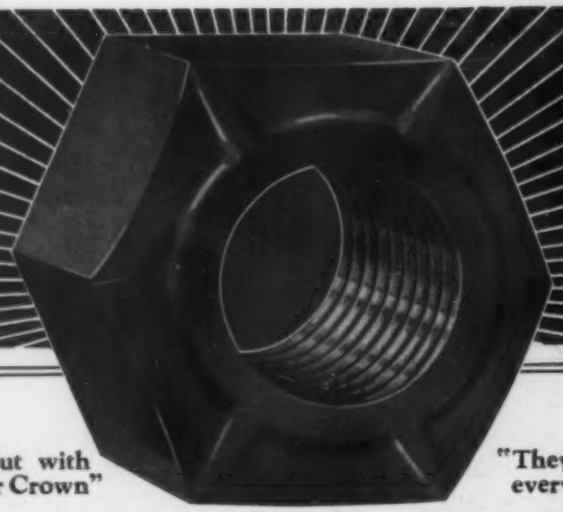
General Offices: Frick Building, Pittsburgh, Pa.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis

Pacific Coast Representatives: UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

Export Representatives: UNITED STATES STEEL PRODUCTS COMPANY, 30 Church Street, New York City; 36-38 New Broad Street, London, E. C.



"The Nut with the Star Crown"

"They lock on every thread"

The first positive mechanically correct Lock Nut

The SELFLOCK UNIT NUT

THE design of this nut is the culmination of critical and exacting experimentation guided by a close familiarity with every development made in lock-nuts past and present.

The design of the Selflock Thread applies the true mechanical principle of friction to both sides of each thread.

Thus, every thread is a locking unit multiplying the effective locking efficiency several fold.

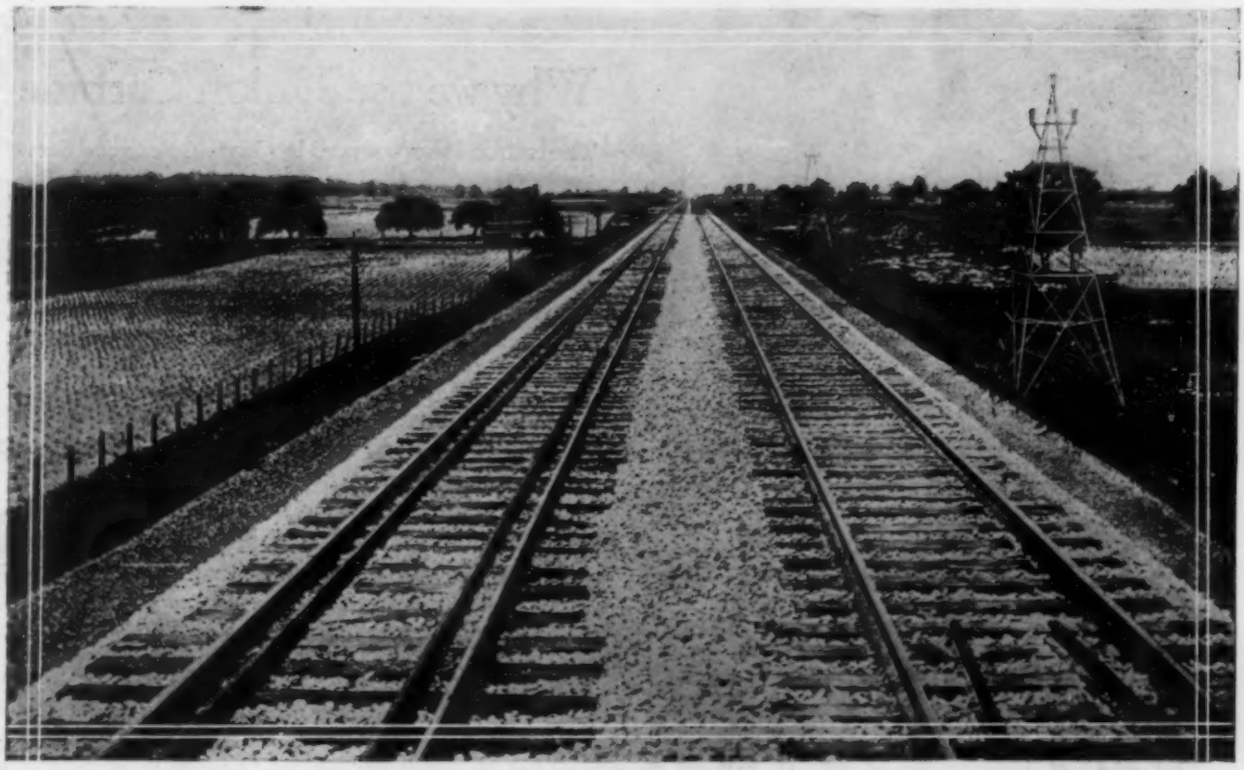
No amount of vibration and strain such as encountered on railway rolling stock, can loosen the tight, vise-like grip of the Selflock Unit Nut.

Selflock Unit Nuts are easily applied, fit any standard bolt and will also lock on under size bolts. Selflock Nuts give maximum service because the lock will not wear out and can be applied from either face repeatedly.

Graham Bolt & Nut Company

Pittsburgh

ESTABLISHED 1874



Consistent Uniformity

Chemical Weed Killers Need Uniform Application

LACK of uniform results in weed killing is due to irregular distribution of chemical.

Chipman "Geared-to-the-Axle" Spraying Equipments coordinate distribution with train speed. All guesswork is eliminated. Chipman sprays are compensated for pressure so that whether one or nine spray nozzles are open they will all function equally.

ATLAS NON-POISONOUS WEED KILLER provides the means of making complete coverage over a line when used in conjunction with Atlas "A". Atlas "NP" permits a full service through station grounds, grazing territory or water drainage country where Atlas "A" might poison humans or animals, and should also be used where resistant varieties of weeds are present.

Chipman Service permits the use of both chemicals in one spray train. The turn of a valve instantly changes from one to the other. The result is a complete and uniform treatment.

Write for descriptive booklets

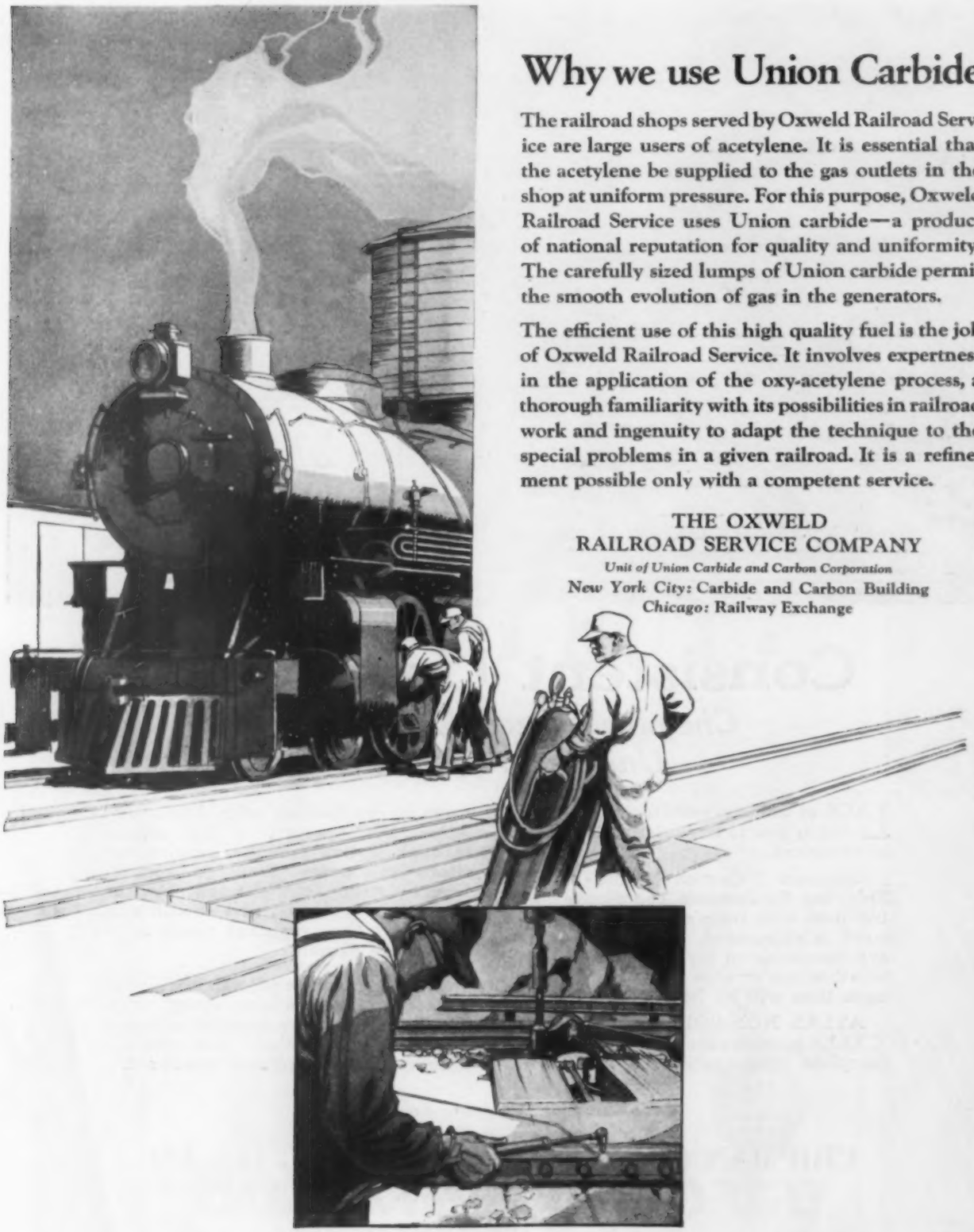
CHIPMAN CHEMICAL ENGINEERING CO., INC.
BOUND BROOK, N. J.

Factories

Bound Brook, N. J. **Clearing, Ill.** **Palo Alto, Cal.** **Houston, Tex.**

The Chipman Chemical Engineering Co., Inc., is sole licensee for Non-Poisonous Weed Killer under United States Patent No. 1,534,289.

ATLAS NON-POISONOUS WEED KILLER SERVICE



Why we use Union Carbide

The railroad shops served by Oxweld Railroad Service are large users of acetylene. It is essential that the acetylene be supplied to the gas outlets in the shop at uniform pressure. For this purpose, Oxweld Railroad Service uses Union carbide—a product of national reputation for quality and uniformity. The carefully sized lumps of Union carbide permit the smooth evolution of gas in the generators.

The efficient use of this high quality fuel is the job of Oxweld Railroad Service. It involves expertness in the application of the oxy-acetylene process, a thorough familiarity with its possibilities in railroad work and ingenuity to adapt the technique to the special problems in a given railroad. It is a refinement possible only with a competent service.

THE OXWELD
RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
New York City: Carbide and Carbon Building
Chicago: Railway Exchange

Oxweld
Railroad Service

Look for the Spiral Knurled Mark. It positively and easily identifies Reading Genuine Wrought Iron Pipe.

Freezing Snows— or Scorching Sands!

EXPOSED to the utmost extremes of heat or cold—installed even under the most adverse conditions—Reading Genuine Wrought Iron Pipe operates signals efficiently, dependably and with greater freedom from replacements and repairs than you have ever known.

The tough, fibrous structure withstands sudden shocks and continuous vibration. The natural slag content resists corrosion to the utmost, giving years and years of added life.

Reading Genuine Wrought Iron Pipe represents the best that the finest men, machinery and materials can produce. The finest that far-sighted, thrifty railroad executives can *buy!*

READING IRON COMPANY

Reading, Pa.

World's Largest Manufacturers of Genuine Wrought Iron Pipe

Boston	New York	Philadelphia	Baltimore	Detroit
Pittsburgh	Cincinnati	Chicago	Seattle	Cleveland
St. Louis	Los Angeles	Tulsa	Dallas	Buffalo

READING PIPE

GENUINE WROUGHT IRON

Turning Minutes Into Dollars

UNNECESSARY train stops at outlying switches mean an average loss of 13.24 minutes in train schedules — determined by investigation at *84 locations on 17 railways*. Installation of power operated switches and signals eliminated this 13.24 minutes in lost time by arranging for remote control from the nearest block or station office.

Capitalizing time lost, unproductive use of fuel, wear and tear on equipment in stopping and starting, and disarrangement of train schedules, it is not surprising that installations of remotely controlled switches in most cases, pay for material and installation costs within a year.

The Union Style "M" electric switch and lock movement is especially adaptable to this service. It is ruggedly constructed, flexibly controlled and may be depended upon to render reliable and durable service.

The Union Table Interlocker, used to control outlying switches and signals, effectively functions to assure safety of operation.

Let us assist you in *Turning Minutes into Dollars.*

Union Switch & Signal Co.

SWISSVALE, PA.

How to Answer this one—

There is a renewed public interest in railroads. Every day hundreds of inquiries come into railroad offices from people interested in railroads. That is, they ask questions about things they want to know or think will be interesting.

Trains, Tracks and Travel

By T. W. VAN METRE

Professor of Transportation, Columbia University

will answer all their questions, as the *New York Times* says, "—about engines and trains and ways and means of making them go, in such a manner that little boys can understand—here is a whole field covered, and well covered—Mr. Van Metre leaves nothing to the imagination, but gives facts with a patient array of detail that admits of no mistakes—a thorough exposition of all the phases of track laying, train conducting, railway management and even the care and preservation of machinery."

Won't you tell them about "Trains, Tracks and Travel"? Tell them it can be had through any bookstore and most libraries the next time they ask those troublesome, time-taking questions.

236 pages, 205 illustrations. $3.50 net, postpaid

This book has been edited with the same care and discriminating detail characteristic of the policy that has made The House of Transportation the leader in its field.

SIMMONS-BOARDMAN PUBLISHING CO.
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Please send me a copy of Van Metre's "Trains, Tracks and Travel," for which I enclose $3.50.

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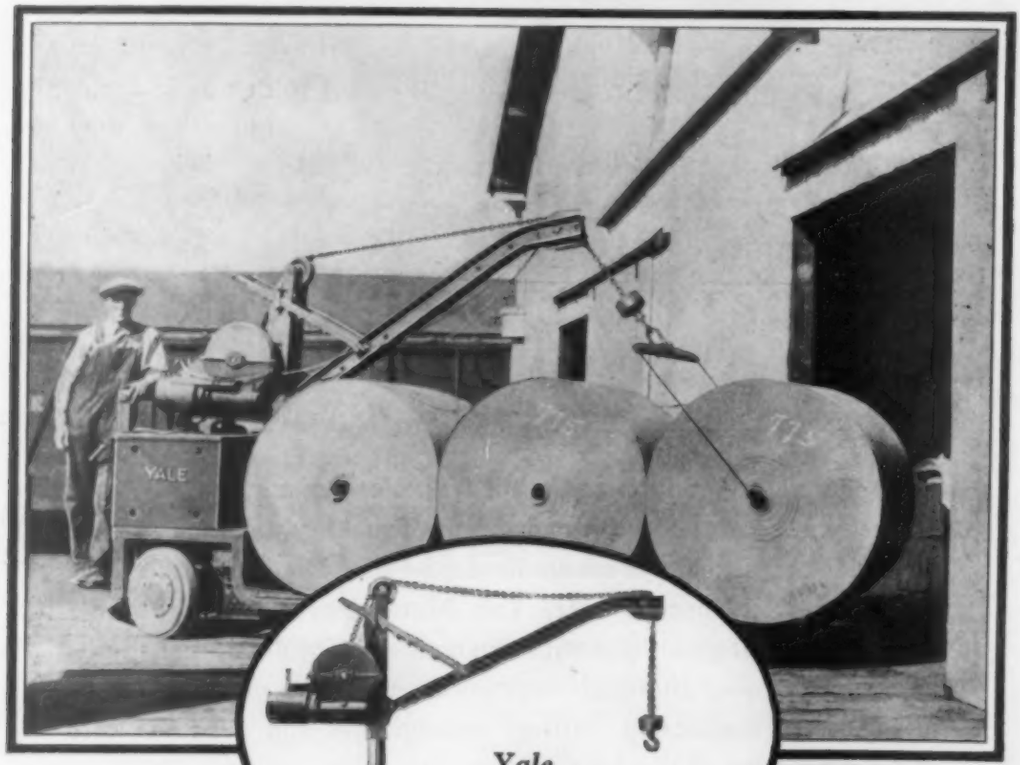
R.A. 4/2/27

YALE—the Key to lower handling costs. Chapter 41 on *Storage Battery Trucking.*

TRADE **YALE** MARK

Yale Type S Crane mounted on the K23 Low Platform Load Carrying Truck.



Yale Type S Crane

A Yale Crane Truck for Loading and Hauling

—Features of the Yale Portable Crane

Steel tubular mast.
Enclosed power unit and gears.
Structural Steel Boom rotating on Ball Bearings.
Automatic limit stops.
Remote control.
Self booming-up racking device.
Yale Steel Hoist Chain and Safety Hook.

The crane can be applied to the following Yale K Series Trucks.

K20 } High Platform Load
K21 } Carrying Truck.
K22 } Elevating Platform 4000 and 6000 lbs.
K25 } capacity High Lift Trucks.
K23—Low Platform Load Carrying Truck.

A Yale Electric Crane Truck saves time and money in loading and transporting many kinds of materials. It is particularly adapted for intra-plant or yard service where heavy castings, structural shapes or bulky crated material must be handled safely and expeditiously.

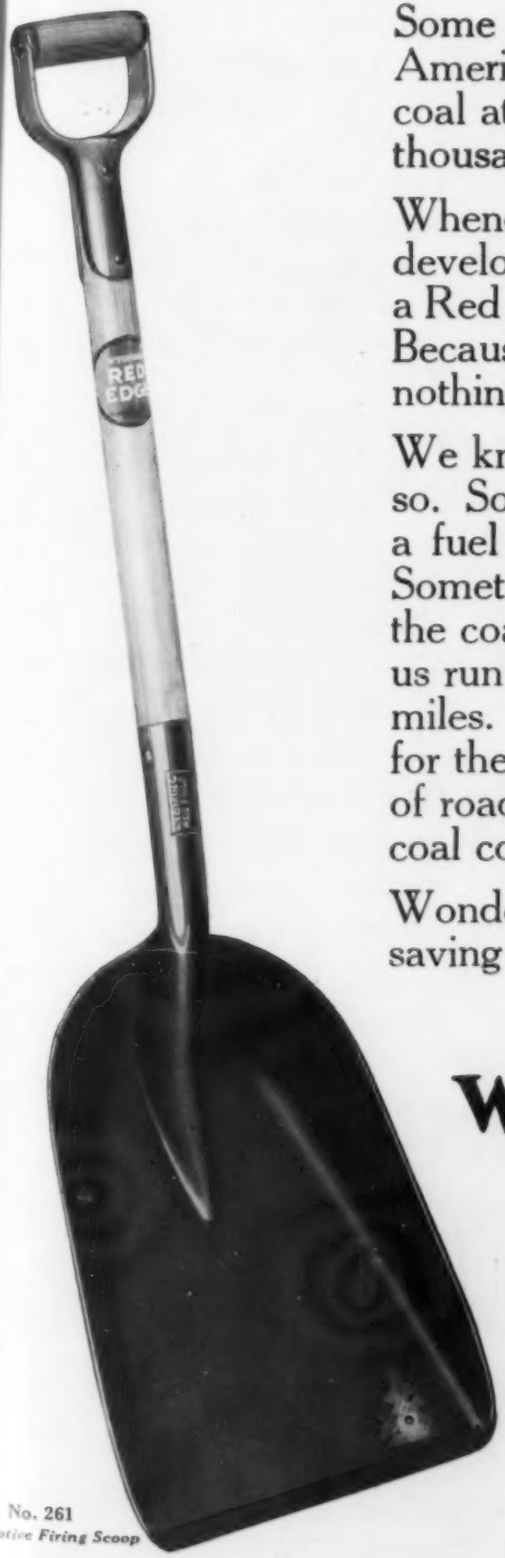
Not only does this crane truck do the work of several men easier and faster, but the remote control system of the Yale Crane Truck makes it safe for one man to do the job alone. He is able to place his sling and hold it fast to the load with one hand, while with the other he turns on the power to lift the load. He swings the boom around and deposits the package on the platform of the truck, loads the second, third or fourth, as the case may be, and then steps around front, up on the operator's platform, and away goes the load. One man with a Yale Crane Truck has done the work of a group of men and in much less time. Another "Yale key to lower transportation costs."

The Yale & Towne Mfg. Co., Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

Saved: 35 lbs. of Coal per Locomotive per 1000 Miles



No. 261
Locomotive Firing Scoop

Some time ago the newspapers reported that American railroads were beginning to conserve coal at the rate of 35 lbs. per locomotive per thousand miles. It gave us a big kick.

Whenever we hear that a certain railroad has developed the coal saving complex we recognize a Red Edge customer or a mighty good prospect. Because, if there is one thing a Red Edge does nothing else but, that thing is the saving of coal.

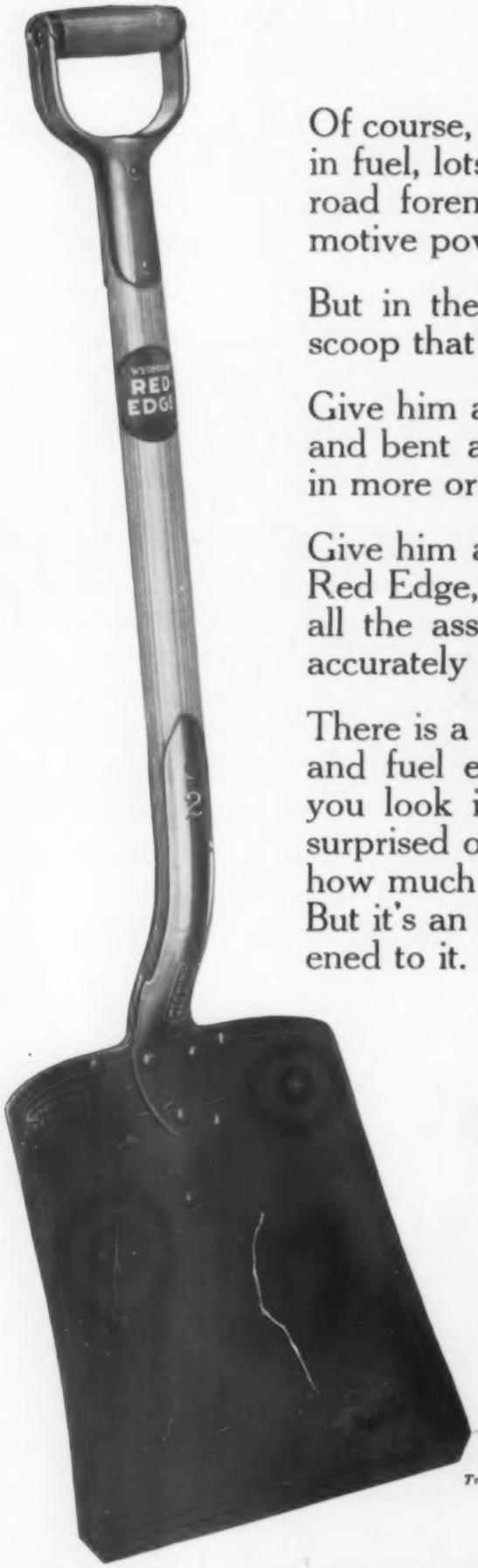
We know that, because men who know tell us so. Sometimes it's a fireman who has just made a fuel performance record with his Red Edge. Sometimes it's a higher-up who has been studying the coal problem. And most of the figures given us run a whole lot better than 35 lbs. per 1000 miles. Not that 35 lbs. is not a good average for the country, when you think of the number of roads that don't seem to have got around to coal conservation yet.

Wonder if ***your*** road would be interested in saving a bit of coal?

WYOMING
RED EDGE
LOCOMOTIVE SCOOPS

We spent 50 years learning to make one grade of shovel

Made by THE WYOMING SHOVEL WORKS, Wyoming, Pa.



Of course, when a road begins to show a real saving in fuel, lots of credit is due to fuel supervisors and road foremen of engines and superintendents of motive power.

But in the last analysis it is the fireman and his scoop that must do the actual saving.

Give him a clumsy scoop or one that gets battered and bent and naturally he scatters the coal about in more or less hit or miss fashion.

Give him a keen edged, well balanced scoop like Red Edge, that does not lose its shape, and he has all the assistance he needs in spreading his coal accurately and economically.

There is a closer connection between a good scoop and fuel economy than you would believe until you look into the matter. In fact we used to be surprised ourselves when firemen began telling us how much coal they could save with a Red Edge. But it's an old story now and we have gotten hardened to it.

WYOMING
RED EDGE
SHOVELS

No. 251
Track Shovel

We spent 50 years learning to make one grade of shovel

Made by THE WYOMING SHOVEL WORKS, Wyoming, Pa.

Good Lubrication
is Cheaper than Bearings

THE cost of a cheap lubrication contract does not stop with the cost of the lubricants. Only the engineers and the round-house crew know the true cost of "low-priced" lubrication.

When the relation between lubrication and depreciation is properly analyzed, Franklin Railway Lubricants often cost *less than nothing.* Certainly a Franklin contract represents the lowest-cost lubrication your road can procure.

As the only organization devoted exclusively to railroad lubrication; backed by years of research and specialization; equipped to produce and deliver any desired quantity at any time; we invite you to place your lubrication problems on our shoulders.

We are as near as your telephone. Wire, write or phone Franklin 365.

The Franklin Railway Oil Co.
Franklin, Pa.

KEEPING PACE WITH PROGRESS

HEAD FREE Continuous JOINT

THE Head Free fillet bearing area can never be diminished.

A cocked Head Fishing bar reduces the head bearing to almost a line.

THE RAIL JOINT COMPANY
165 Broadway, New York City

RAIL JOINTS

The Kind of Service Fairmont Insists Upon

A Foreman Car Inspector and two men are now taking care of 50 miles of very busy main line and 25 miles of branch with a covered M2 Fairmont car like that shown below.

Rain or shine, at all hours of the day or night they go shooting back and forth, keeping out of the way of traffic and quickly making light repairs and fixing hot boxes.

It is worth real money to get cars of perishable freight moving again soon after they are set out for repair. No matter what out-of-the-way place cars are dropped, this foreman gets there in a hurry with his two helpers and half a ton of jacks and tools.

He gets 30 miles per gallon of gasoline and his Fairmont car has already run twice as long without overhauling as any other make used on this job.

Performance on the Job Counts

FAIRMONT RAILWAY MOTOR CARS

Inspection—M19

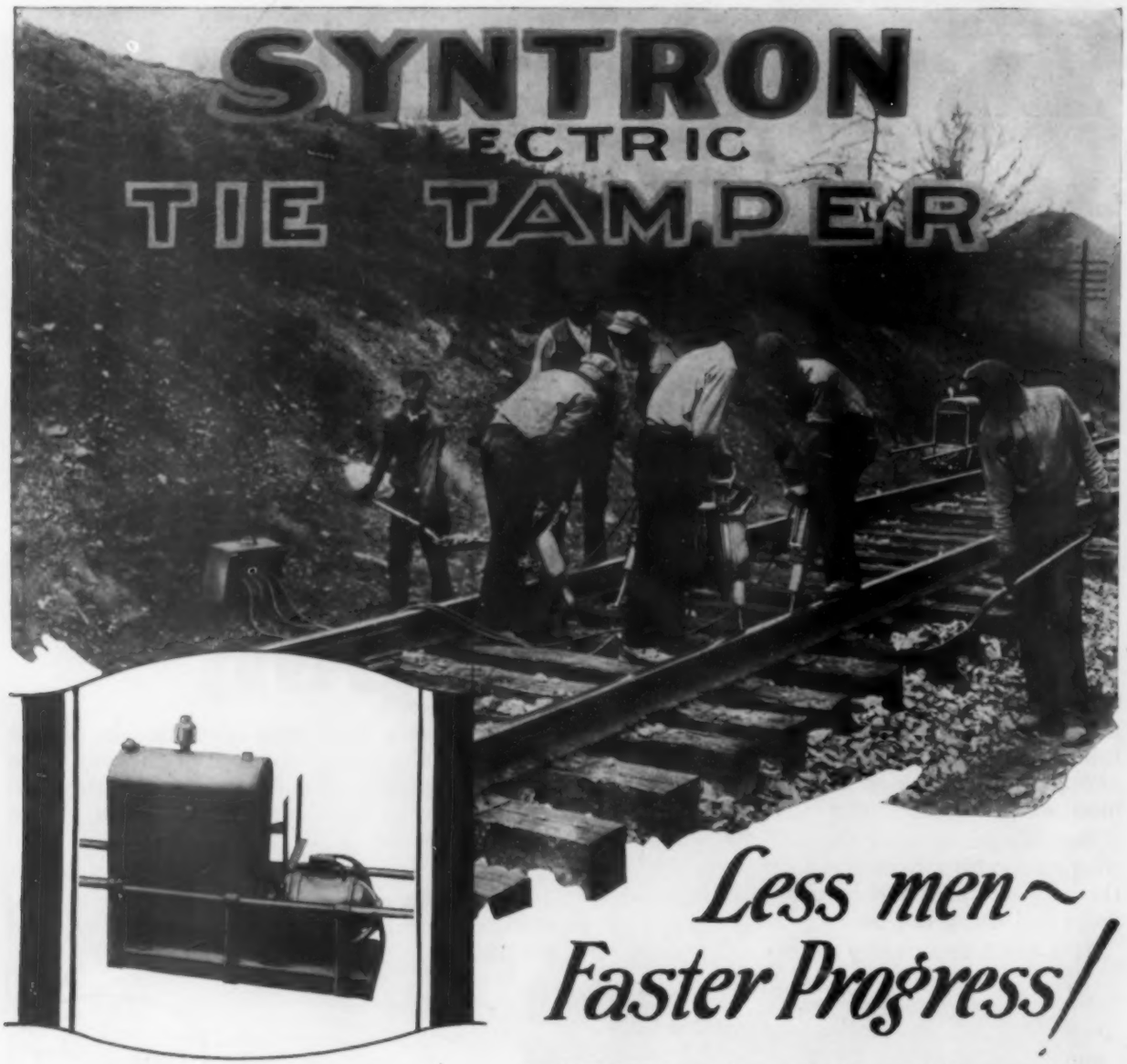
Light Section—M14

Section A2 M2 S2

FAIRMONT RAILWAY MOTORS, Inc.
Fairmont, Minnesota

District Sales Offices:
NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO
WASHINGTON, D.C. NEW ORLEANS WINNIPEG, CANADA

BALDWIN LOCOMOTIVE WORKS
Foreign Representatives



Less men~ Faster Progress!

Syntron Power Plant

Compact, light in weight and easy to handle, the portable Syntron Power Unit is ideal for use in heavy main line traffic where quick moves are often necessary.

This unit consists of a gas engine and a 110 volt A. C. generator. Runs automatically—requires absolutely no attention other than for gas, oil and water, automatically supplying the current for the Syntron Tie Tampers as well as any other portable electric tool used in maintenance work.

"Syntron-ize to Economize"

THE Syntron is the most efficient Tie Tamper ever devised and makes possible savings in railroad track maintenance never before realized.

Through the unique application of magnets energized by alternative current, the Syntron Tie Tamper strikes 1500 blows a minute making it possible for the four workmen shown above to do the work of twelve pick tampers.

Syntron not only triples the amount of track tamped per day, but also tamps a smoother and firmer roadbed that lasts two to three times as long as a hand tamped track.

From every standpoint the Syntron Tie Tamper is the ultimate development in practical and economical mechanical tie tampers.

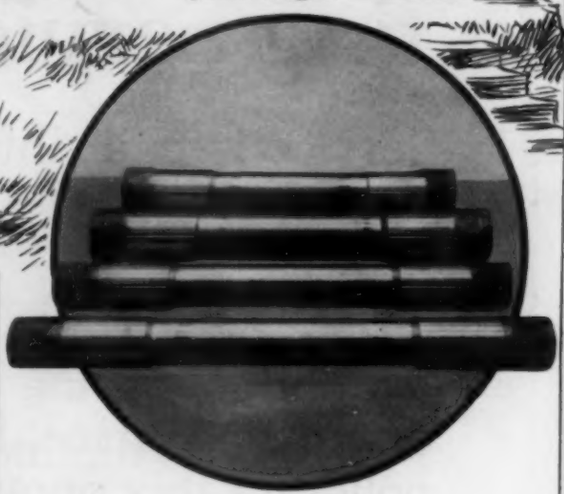
Let us tell you more about it.

THE SYNTRON COMPANY

LEXINGTON AVENUE · PITTSBURGH, PA.

RECORDS THAT STAND

RA-LOY

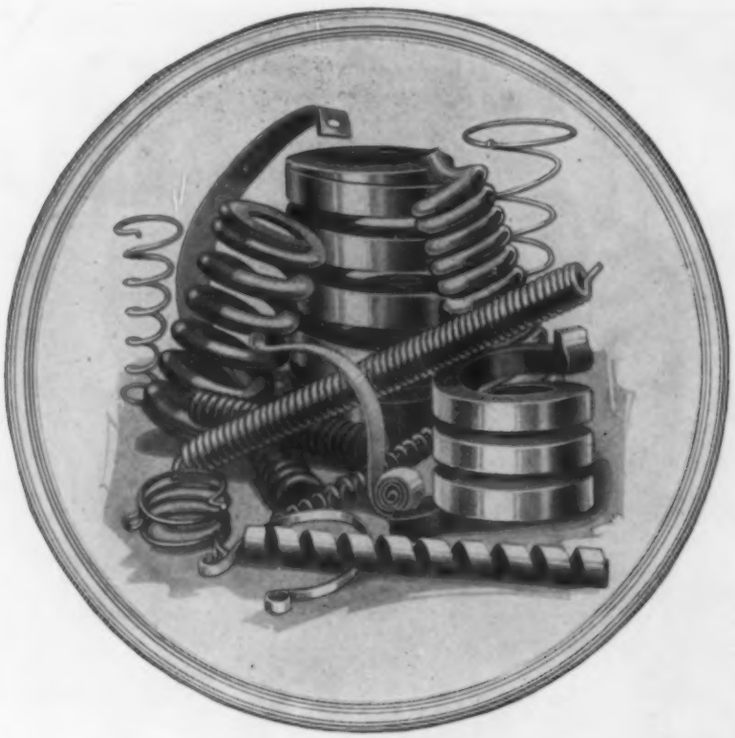


AMERICAN golf stars are attracting world-wide attention, not merely because of their pronounced success in recent games but because as a nation, we produce so many players who play uniformly well. Their high averages excite wonder as well as admiration in other countries, but here it is expected because it is typically American.

The urge to lead—to show the way, is natural and inevitable in every field of American endeavor. It is this ideal which has been the motive force of the Andrews Steel Co. in perfecting its processes of Alloy Steel making. This steel is made and sold in billet form and is particularly adapted for the fabrication of locomotive reciprocating parts, which include motion work, side rods, axles, and all parts demanding the utmost in strain and wear.

THE ANDREWS STEEL CO.
NEWPORT, KENTUCKY

RECORDS that STAND
Three champion golf titles were held in 1926 by one player.



Putting Service Into Springs

Service is built into Quality Springs by the use of carefully selected material; thorough, unhurried, experienced workmanship and most rigid inspection.

To build a spring up to a standard, not down to a price, has always been the policy of this organization.

Quality Springs

AMERICAN STEEL & WIRE COMPANY

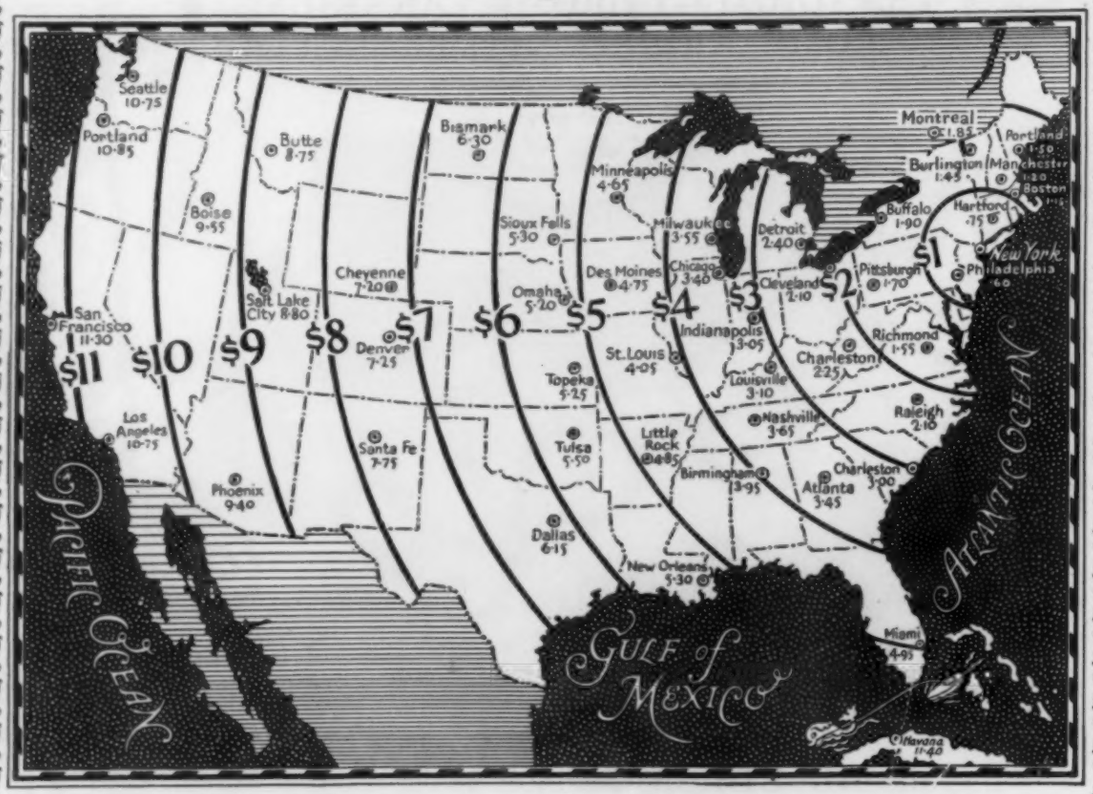
Sales Offices:

Chicago New York Boston Cleveland Worcester Philadelphia Pittsburgh Buffalo Detroit Cincinnati Baltimore Wilkes-Barre St. Louis Kansas City St. Paul Oklahoma City Birmingham Memphis Dallas Atlanta Denver Salt Lake City

Export Representative: U. S. Steel Products Co., New York

Pacific Coast Representative: U. S. Steel Products Company, San Francisco, Los Angeles, Portland, Seattle

HOW FAR YOUR TELEPHONE DOLLARS WILL GO



Typical station-to-station day rates

Chicago to St. Louis, $1.45 Pittsburgh to New York, $1.70
Atlanta to San Francisco, $9.40 Denver to Indianapolis, $4.60
Cleveland to Omaha, $3.45 Boston to Detroit, $2.85
Seattle to Minneapolis, $6.45

What far away call should you make now.....number, please?.....

BELL LONG DISTANCE SERVICE

MIDVALE

FORGING BILLETS

CARBON VANADIUM — CHROME VANADIUM —
CHROME NICKEL—NICKEL—STRAIGHT CARBON

Your Own or Standard Analysis

A FINISHED FORGING is no better than the BILLET from which it is made. Specifications of today make it necessary to have sound metal as a basis. Use a FORGED BILLET and cut down your rejections and failures.

FORGINGS TIRES CASTINGS
HIGH SPEED and CARBON TOOL STEELS

THE MIDVALE COMPANY

NICETOWN, PHILADELPHIA

DISTRICT OFFICES:

NEW YORK	PITTSBURGH	WASHINGTON	CLEVELAND	CHICAGO	SAN FRANCISCO
165 Broadway	Grant & 5th Ave.	15th & H Sts., N. W.	995 Euclid Ave.	332 S. Michigan Ave.	681 Market St.

TOOL AND ALLOY STEEL WAREHOUSES:

PHILADELPHIA CLEVELAND SAN FRANCISCO

Syenite polished

A popular design in a new and better form

Syenite Polished has the effective Syenite design which, because of its irregularity lends itself for use in buildings of any style of architecture. This new glass for doors, partitions, etc., has the smooth side ground to a plate glass finish and permits an equal distribution of light with a soft and pleasing effect.

When you want a glass effective for its purpose, and one that will not look "foreign" to the general scheme of the building, specify "Syenite Polished." The fact that you can have the same glass plain or wired gives you uniformity and beauty when the best is desired.

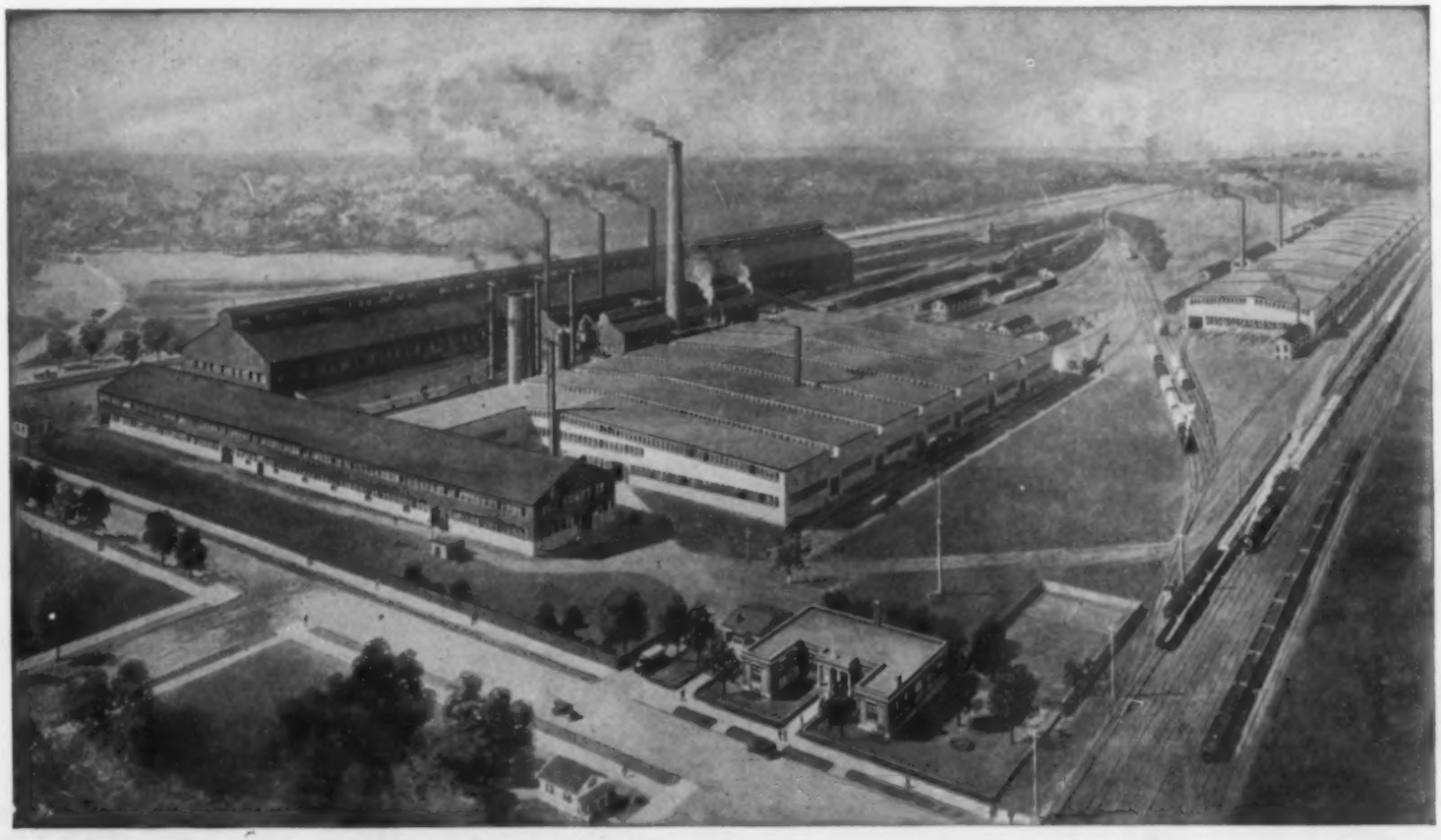
A sample will be gladly sent to you upon request

Syenite Polished
Sizes up to 56" wide and 120" long. Thickness about ¼ of an inch.

Specify

"MISSISSIPPI"

MISSISSIPPI GLASS COMPANY
220 Fifth Avenue New York
CHICAGO ST. LOUIS



Railway Steel-Spring Co., Chicago Heights Plant, Chicago Heights, Illinois

Modern Plants Fully Equipped and Centrally Located Assure Prompt Delivery of High Grade Products to Purchasers of "Railway" Specialties

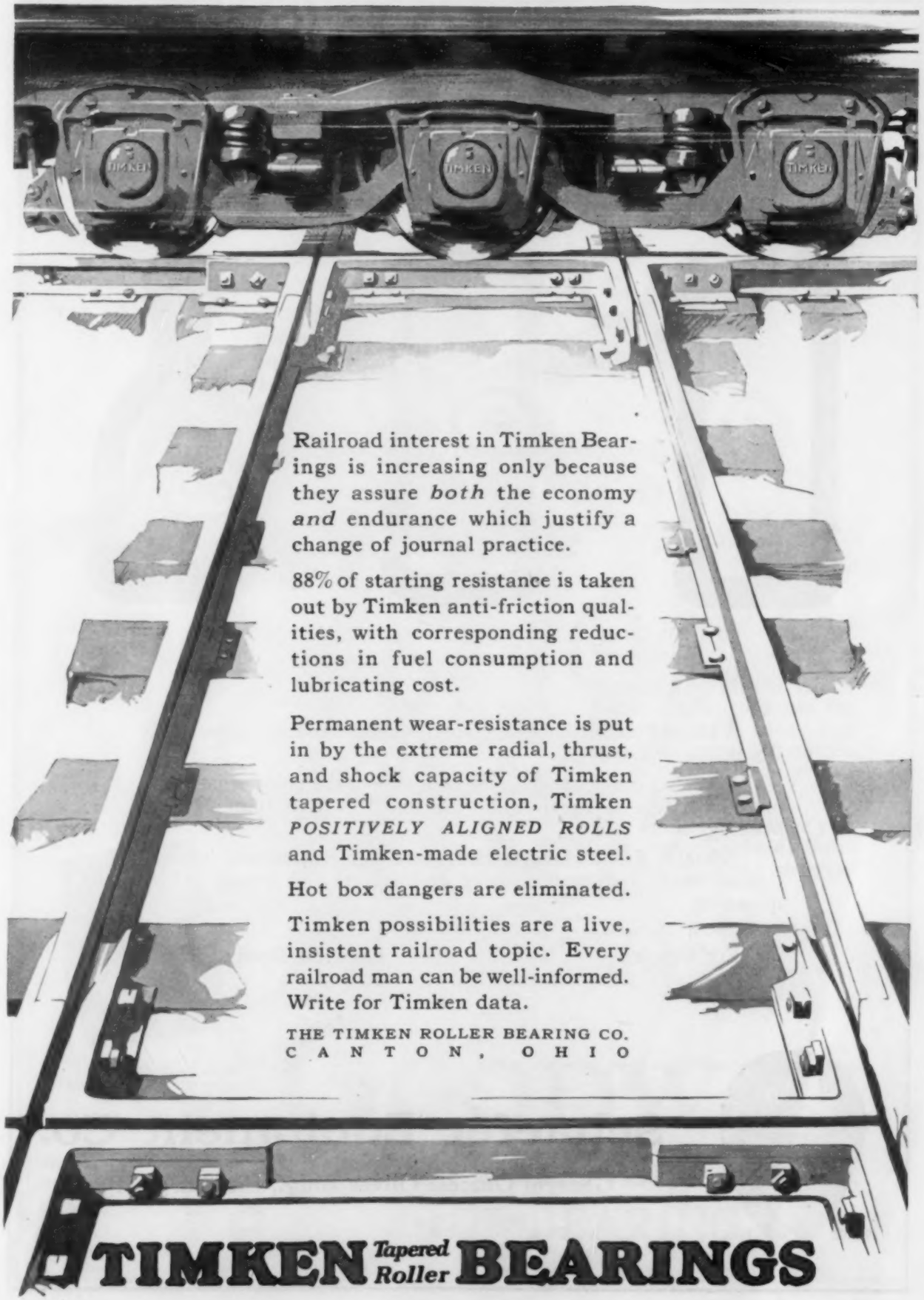
Manufacturers of Springs—Locomotive Tires—Car Wheel Tires—Steel Tired Wheels—Journal Box Lids

Railway Steel-Spring Company

30 CHURCH ST., NEW YORK

Branch Offices:

Chicago, Ill. St. Paul, Minn. | Detroit, Mich. Dallas, Texas | Norfolk, Va. St. Louis, Mo. | Louisville, Ky. Pittsburgh, Pa. | Denver, Colo. Montreal, Que. | San Francisco, Cal.



Railroad interest in Timken Bearings is increasing only because they assure *both* the economy *and* endurance which justify a change of journal practice.

88% of starting resistance is taken out by Timken anti-friction qualities, with corresponding reductions in fuel consumption and lubricating cost.

Permanent wear-resistance is put in by the extreme radial, thrust, and shock capacity of Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken-made electric steel.

Hot box dangers are eliminated.

Timken possibilities are a live, insistent railroad topic. Every railroad man can be well-informed. Write for Timken data.

THE TIMKEN ROLLER BEARING CO.
C A N T O N , O H I O

TIMKEN *Tapered Roller* **BEARINGS**

A dependable Brake Beam Hanger is as essential as the Air Brake itself.

A Good Brake Beam Suspension prolongs the Life of the Brake Beam.

A perfect brake hanger must be square at the point of bearings, must have legs of equal length and must be free from flaws in bending.

Schaefer Brake Hangers meet these requirements and in addition are made from wear resisting steel and are heat treated and oil quenched.

For Repairs For New Equipment

HOMOGENEITY STRENGTH EFFICIENCY TRADE MARK

Schaefer Equipment Co.

General Offices: Oliver Bldg., Pittsburgh, Pa.

Slid Flat—Never!

"SLID Flat" applies to side-bearings as much as to car wheels and makes side-bearings equally useless.

Goodwin Roller Side-Bearings cannot be slid flat. The roller is free to take its natural path and it moves over a flat surface. It revolves between successive load applications, thus presenting a new bearing surface each time the load is applied. It is unhampered by axle or trunions.

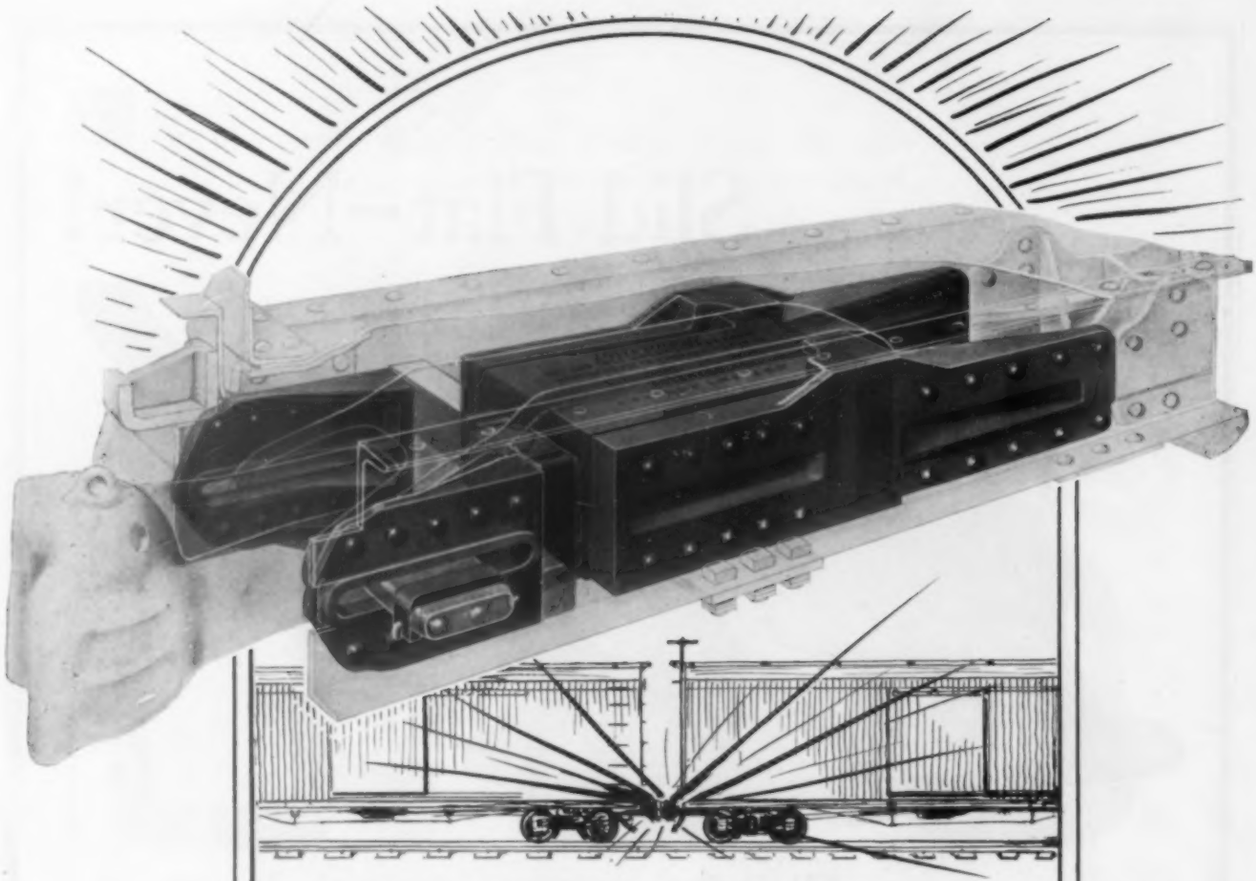
Goodwin Side-Bearings have ample capacity for the heaviest cars and are absolutely dependable for prolonged satisfactory service.

We would like to have you test the Goodwin Side-Bearing in your severest service.

Goodwin Side-Bearing Co.
INCORPORATED
110 E. 42nd St. New York
Peoples Gas Bldg. Chicago

"It Cannot Be Caught Napping" tells the story of the Goodwin Side-Bearing. We will be glad to send you a copy.

GOODWIN
SELF SPOTTING ROLLER SIDE-BEARING



Super Service Under Terrific Impact

TRADE MARK

Universal

REG. U.S. PAT. OFF.

SUPER DRAFT RIGGING

"Universal Super Draft Rigging" measures up to, and a little beyond, the standard of service required to withstand the terrific impact and shock of strenuous modern railroading.

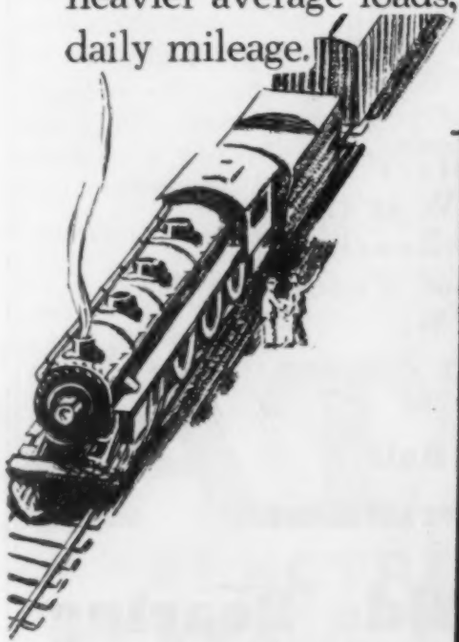
Universal Draft Gear Attachment Company

Railway Exchange Bldg., CHICAGO

Transportation Bldg., Montreal

One Way of Reducing Time-Out-of-Service in Freight Car Operation

Your statistics will tell you that one of the major reasons for the presence of freight cars on the repair track instead of in service has to do with *wheels*. In recent years this condition has been accentuated by the increasingly strenuous service to which freight cars are subject—longer trains, heavier average loads, greater daily mileage.

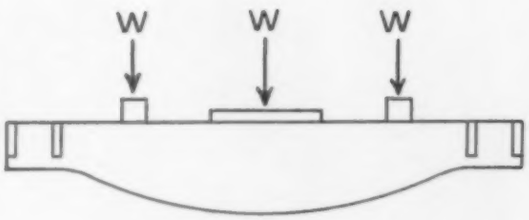


It is in this connection that the new Gary Light Weight Wheel is of particular interest. *Wrought Steel* and long, steady operation are synonymous terms. The use of Gary Wrought Steel Wheels is therefore a most effective way of reducing time-out-of-service thru wheel troubles. • • • Our wheel specialists will be glad to give you further information.

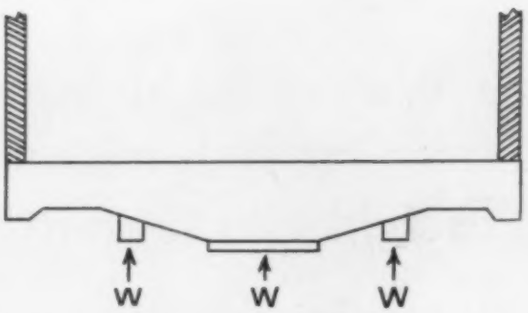
Illinois Steel Company

208 South LaSalle Street
Chicago, Illinois

BOLSTERS

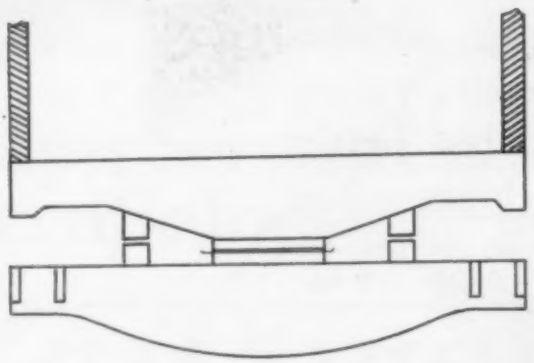


Truck Bolsters are Designed to Carry Load W at Either Side Bearing or Center Plate.



Many Body Bolsters Are Not Designed to Carry Load W at Side Bearings.

W=½ Total Weight of Car and Load

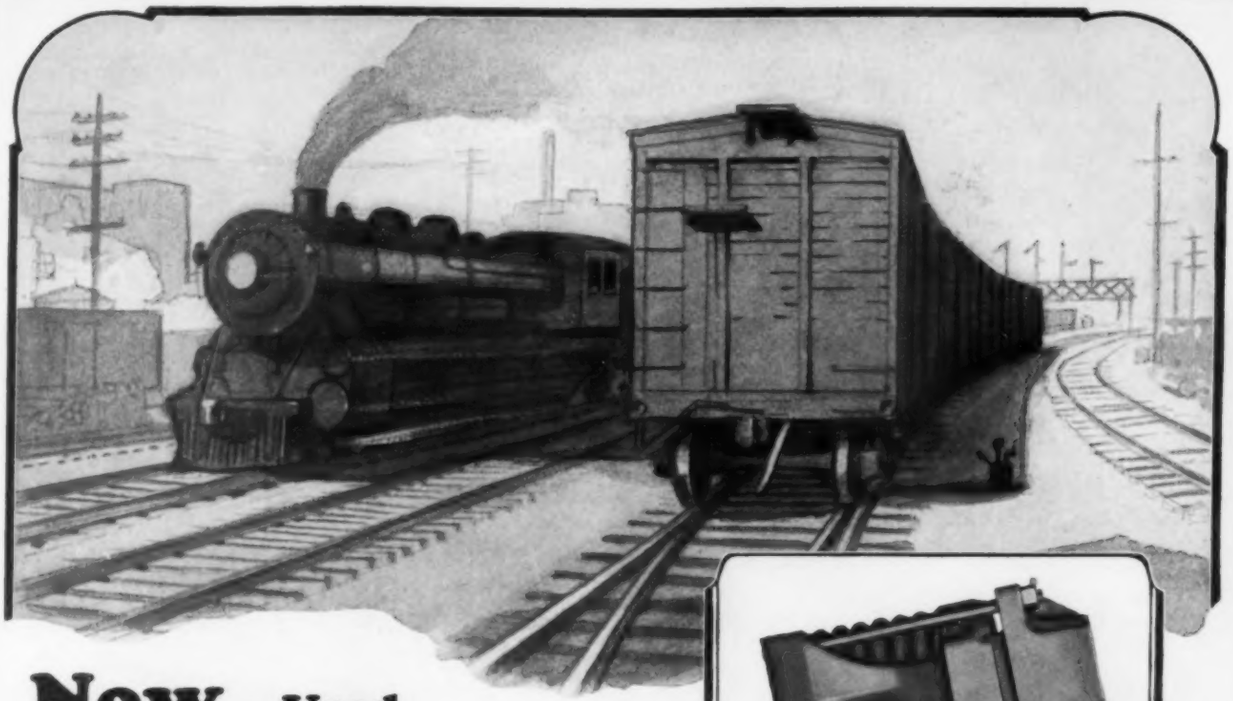


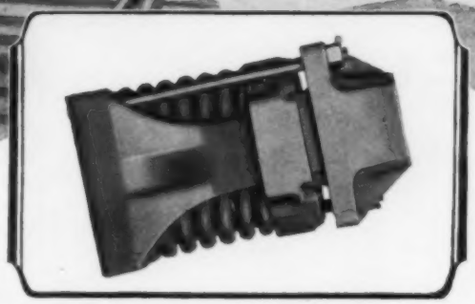
If Truck and Body Bolsters are Designed to Carry Load W at the Side Bearing, the Side Bearing Should Also be Capable of Functioning Under Load W.

Save Wheels Save Rails

Save Power Prevent Derailment

A New Heavy Duty Side Bearing





National M-17 Draft Gear

NOW—Used On Many Thousand Cars

ON many thousand cars National NACO Steel Draft Gears are giving the full protection demanded by present day service and equipment.

The ruggedness of these gears is a result of superior material, design and workmanship. All possible vital parts of every National NACO Steel Draft Gear are made of electric furnace steel and then given long and exact heat treatment. Every draft gear is made under National's rigid standards of workmanship and engineering in our own plant.

Giant strength, consistent capacity and smooth action—only these essential qualities can protect underframes and sills from damage and insure higher utilization.

NACO Steel

Trademark Registered

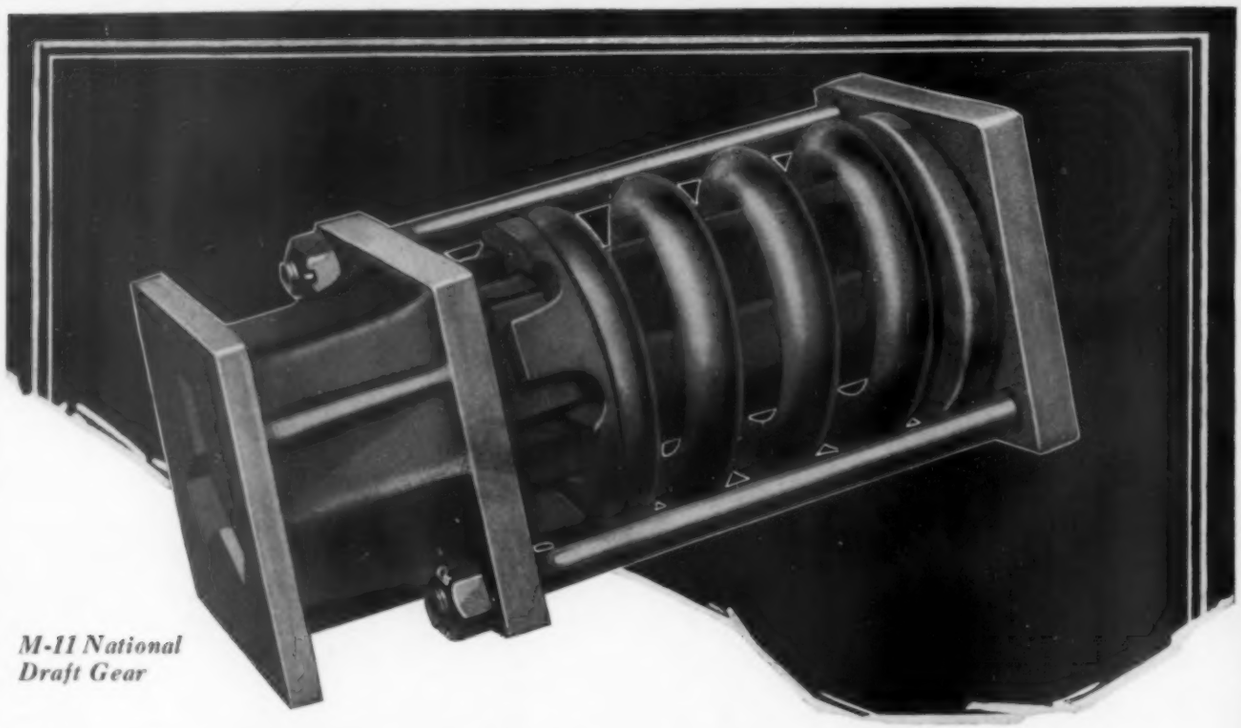
The castings for every National NACO Steel Draft Gear are heat treated in electrically operated and controlled furnaces. Uniform results are secured by this method.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.
General Office: Cleveland, Ohio
Sales Offices: New York, Philadelphia, Washington, Chicago, St. Louis, San Francisco.
Works: Cleveland, Chicago, Indianapolis, Toledo, East St. Louis, Ill., Sharon, Pa., Melrose Park, Ill.

NATIONAL

ELECTRIC NACO STEEL

DRAFT GEARS



M-11 National Draft Gear

M-11 National Draft Gear

INWARDLY acting wedge pressure against a solid central compression member is the successful principle upon which all National NACO Steel Draft Gears are designed. Oversolid blows are carried on the solid column that protects the working parts of the gear.

The great strength required to sustain and continually absorb, smoothly and consistently, the tremendous smashing blows encountered by modern equipment is amply provided by the generous use of NACO electric furnace steel. All working parts of these draft gears are made of this tough, rugged metal and heat treated in our own automatic electric furnaces. Every step in their manufacture is directly controlled by National Engineers.

Specifications

Travel—2¾".

Followers—Two followers required for riveted or key attached yoke When applied with Farlow attachment no followers required.

NATIONAL MALLEABLE AND STEEL CASTINGS CO.

General Office: Cleveland, Ohio

Sales Offices: New York, Philadelphia, Washington, Chicago, St. Louis, San Francisco.

Works: Cleveland, Chicago, Indianapolis, Toledo, East St. Louis, Ill., Sharon, Pa., Melrose Park, Ill.

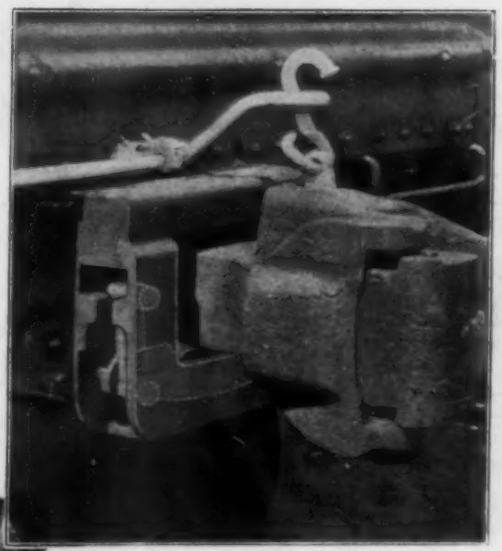
NATIONAL

ELECTRIC NACO STEEL

DRAFT GEARS

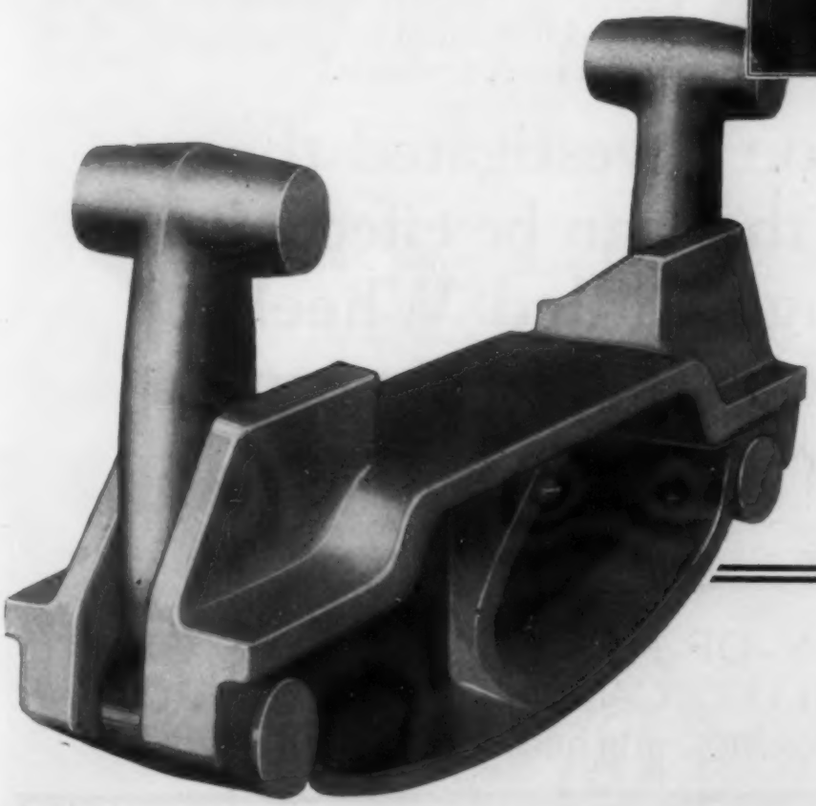
Spreading Sills

The striking casting for Union Centering Device is solid all around the coupler. This gives the proper draft sill tie to prevent spreading at end sill while providing space for the swinging carry iron.

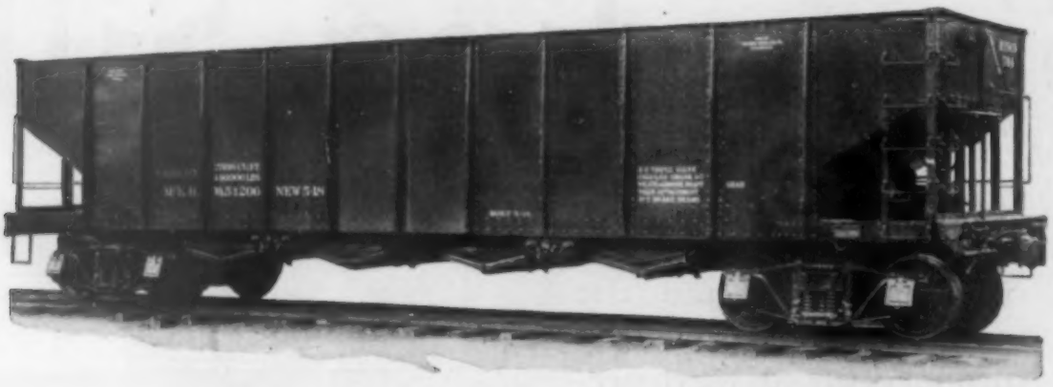


UNION METAL PRODUCTS CO.

NEW YORK CHICAGO PHILADELPHIA ST. LOUIS
WASHINGTON RICHMOND HOUSTON
SAN FRANCISCO KANSAS CITY MONTREAL



50 Plants—Daily Capacities 20,000 Wheels



Tens of Thousands of
Chilled Car Wheels

of A. R. A. 850-lb. type have been applied to 70-ton cars within the past 10 years. A large percentage of those first applied are still in service.

Lowest flange wear and minimum rail abrasion is record for chilled wheels.

? Have you investigated the savings that can be effected by using Chilled Wheels under your heavy equipment ?

A. R. A. Standards

650-lb. Wheel for 30-ton Cars
700-lb. Wheel for 40-ton Cars
750-lb. Wheel for 50-ton Cars
850-lb. Wheel for 70-ton Cars

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

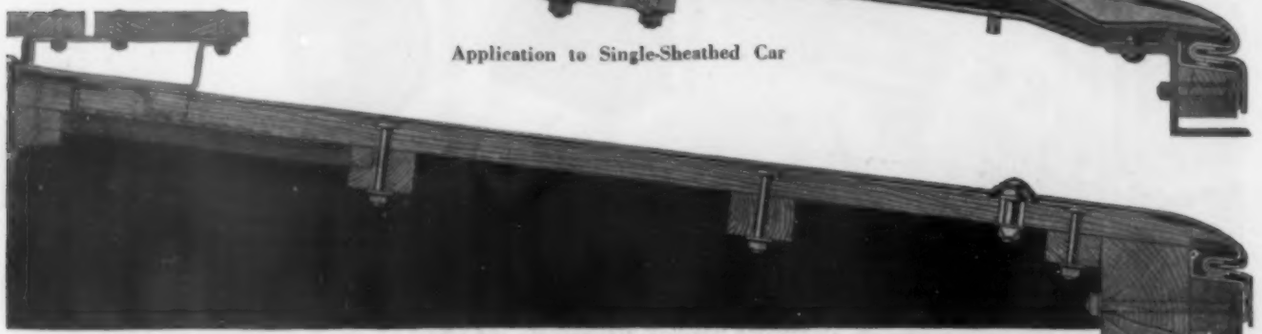
1847 McCORMICK BUILDING · CHICAGO

Not New ~
but Highly Developed
WEIGHT
9,000
LBS
Laboratory Investigation
We maintain a laboratory where our own draft gears and others are tested to destruction. Results under the 9,000 lb. drop weight are compared with results obtained with the 30,000 lb. swinging weight which strikes a draft gear mounted on a 40,000 lb. truck.
Continuous tests are being carried on in this laboratory, but they are only part of the intensive program followed in the continuous development of the capacity and long life of Cardwell Friction Draft Gears.
CARDWELL DOUBLE "A"
SPECIAL DRAFT GEARS
UNION DRAFT GEAR COMPANY
332 S. Michigan Blvd.
Chicago, Illinois
WEIGHT
30,000
LBS
WEIGHT
15,000
LBS

A Universal Roof of Standard Units

Application to A. R. A. Car

Application to Single-Sheathed Car



Application to Double-Sheathed Wood Car

One Size Intermediate Sheet For All Cars

One Size Transverse Cap For All Cars

One Size End Sheet For All Cars

One Size Running-Board Saddle For All Cars

One Size Ridge Cap For All Cars

One Size Inner Flashing
One Size Outer Flashing
For All Cars

A certain number of these standard size parts of the **UNIVERSAL DRY LADING ALL-STEEL ROOF** will fit cars of any length or width, irrespective of wood or steel superstructure, whether double-sheathed or single-sheathed wood or steel or all steel, and irrespective of whether car has wood or steel carlines of any design, or wood side plates or steel side plates of any description.

HUTCHINS CAR ROOFING COMPANY
DETROIT MICHIGAN
Established 1880

Take Advantage Of Engineering Progress

"Locomotives are now being built which will develop a horsepower for little more than 100 lb. loaded engine weight. Five or six years ago it was probably an exceptional freight locomotive which would actually develop more than one horsepower for 150 lb. loaded engine weight."

Horsepower has now become the true goal of locomotive design.

No longer is "tractive effort" the measure of locomotive ability. Power at speed outweighs it in importance.

By building Super-power Steam Locomotives with this end in view, 50% more tons can be hauled at a third higher speed than is possible with the average freight locomotive.

With this fact thoroughly proven, can you afford to order duplicates of old designs when new power is needed?

G. M. BASFORD COMPANY
17 East 42nd Street
New York City

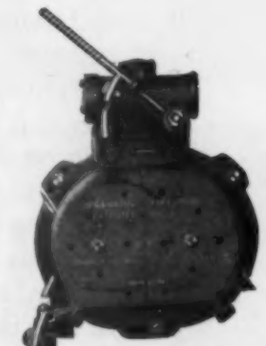
More Intensive Power Production

The success of Super-Power Steam Locomotives in hauling greatly increased tonnage at higher speeds has been due to their more intensive production of power.

To high horsepower, the goal of modern design, Franklin has contributed many elements. These have been coordinated in the construction of the Super-Power Locomotive.

The LIMITED Cut-off

Probably the most important capacity increaser has been The Limited Cut-Off which compels the expansive use of steam at all times, thereby reducing steam consumption from 10 to 30%. It also reduces the maximum variation in torque which permits using a lower factor of adhesion and secures more power in starting. By giving 25 to 50% increased port opening, The Limited Cut-Off also increases power at speeds.

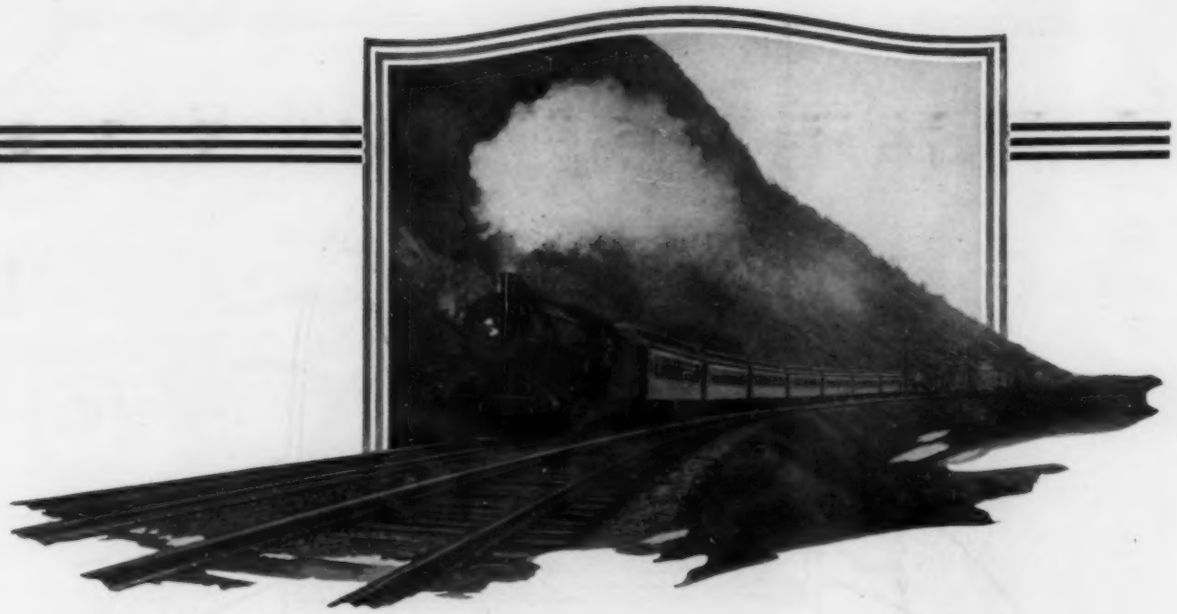


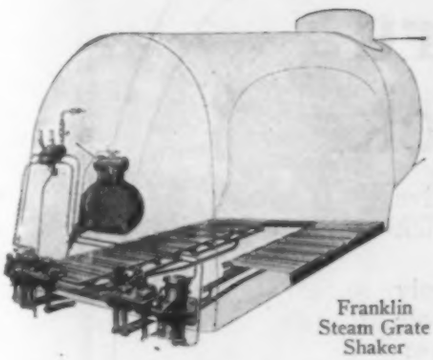
Franklin Automatic Firedoor

But before steam enters the cylinders, Franklin devices have had an important influence on its economical production.

The start is made where coal enters the firebox. Here Franklin Automatic fire doors cut off the fire-killing rushes of cold air and encourage single shovel firing. They do so at a minimum cost, producing more steam, but less maintenance.

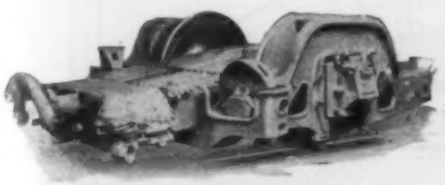
FRANKLIN DEVICES





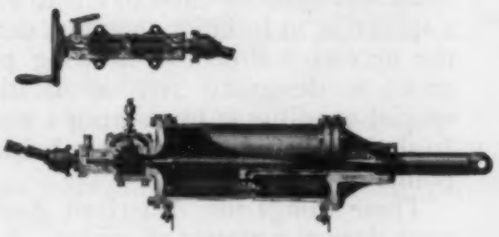
Franklin
Steam Grate
Shaker

For free steaming, a clean fire admitting air thru the grates is a necessity. Franklin Steam Grate Shaker makes it physically easy for the fireman to keep the fire in better condition to produce more steam.



The Locomotive Booster

Draw bar pull at any speed is dependent upon cut-off. Franklin Power Reverse Gears make it easy for the engineer to secure and to retain just the right cut-off and thus conserve steam. These gears won't creep.

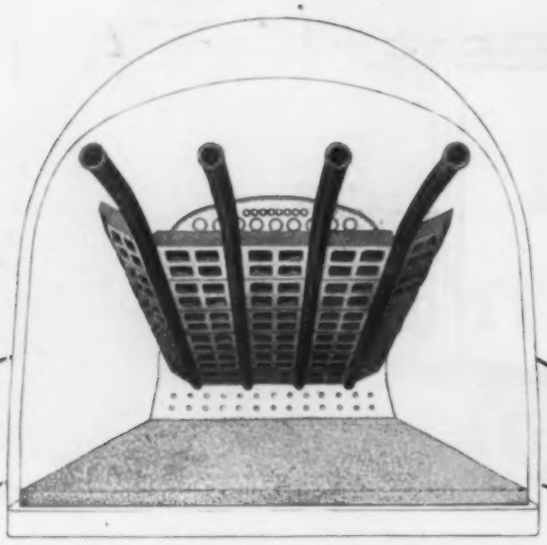


Franklin Precision
Power Reverse
Gear

While steaming capacity controls operation at speeds, starting power limits the size of train that can be hauled. The Locomotive Booster raises this limit by cutting in with thousands of pounds of tractive effort in starting and at slow speeds.

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

New York Chicago St. Louis San Francisco Montreal



Following Thru On Arch Brick

WHEN firebrick is sold for locomotive arch use by the ordinary brick maker his interest ends there.

He has other business to attend to. Only a specialist in locomotive arches can devote the necessary time to following performance; to designing arch applications for special conditions; to assuring a steady and fresh supply of the needed brick at all points of consumption.

These things the American Arch Company does as a matter of course. A volume of a million arch brick per month makes this intensive service possible. The service in turn relieves the railroad of all concern about locomotive arch brick and arches.

AMERICAN ARCH COMPANY, INC.

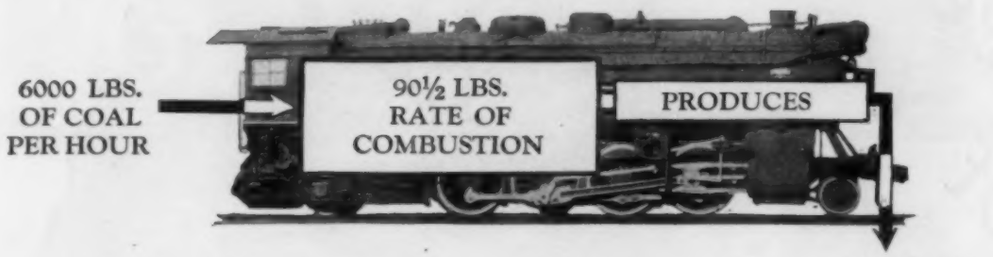
Combustion Specialists

New York Chicago

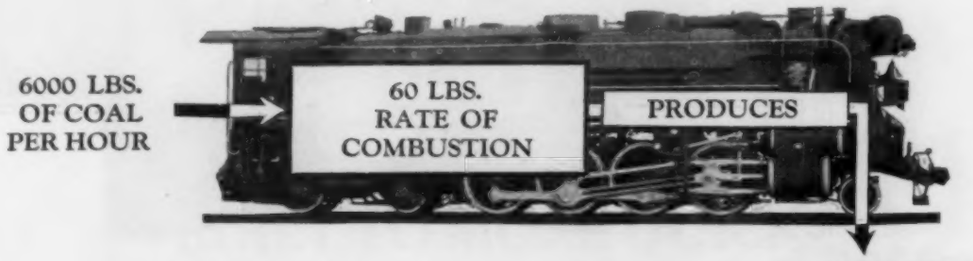
Security Sectional Arch

Follow The Arrows

MIKADO



A-1



THE arrows show how the Super-Power Steam Locomotive, with big grate area and limited Cut-off, compares with one of the best Mikados produced in the past three years.

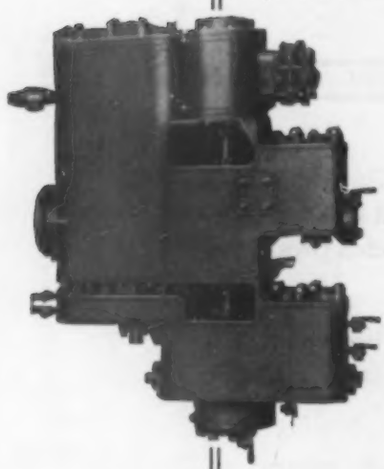
Lower rate of combustion enables the boiler to produce a greater amount of steam for the same amount of coal.

Limited Cut-Off cylinders make each pound of steam do more work.

These two savings working together produce more power for the same amount of fuel.

LIMA
LOCOMOTIVE WORKS
INCORPORATED

Save 12 Per Cent Of Your Coal



HOW far does a tender of coal go towards getting your power over the division? Regardless of the answer, it will go 12 per cent further if your locomotives are equipped with Worthington Locomotive Feedwater Heaters.

The condition of the feedwater as well as preheating plays an important part in the savings effected.

14 per cent of "Worthington" feedwater enters the boiler direct, as condensed steam. This means a reduction of one-seventh of the scale and foaming salts. 80 per cent of the corrosive oxygen is discharged through a vent in the heating chamber of the pump.

These advantages mean better steaming which coupled with the 12 per cent boiler work done by the heater insure increased ton miles per pound of coal.

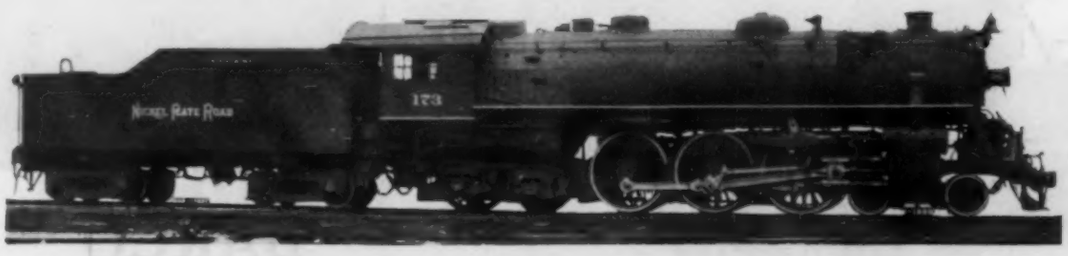
It isn't necessary to make a dynamometer test to determine the savings you can effect. Data on numerous tests has been compiled and is yours for the asking. Why not ask for the data?

Feedwater Heaters
Pumps
Compressors
Condensers
Oil & Gas Engines
Oil & Water Meters

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION, 115 BROADWAY, NEW YORK CITY

BRANCH OFFICES IN 24 CITIES



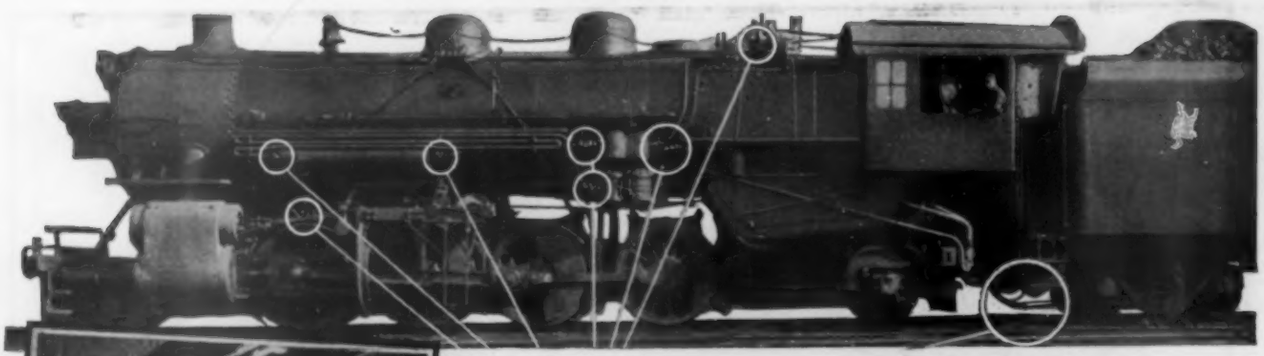
Built for the New York, Chicago & St. Louis Railroad

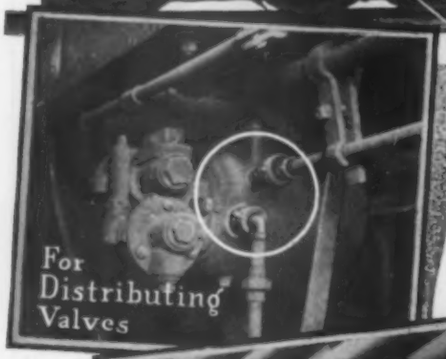
Weight on Drivers, 175,500 pounds; Weight of Engine, 316,500 pounds; Diameter of Drivers, 73 inches; Cylinders, 25 x 26 inches; Boiler Pressure, 210 pounds; Maximum Tractive Power, 39,700 pounds.

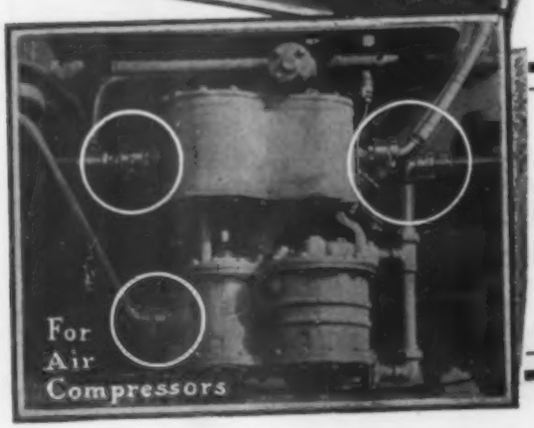
BUILT TO MORE QUICK-LY ACCELERATE AND MAINTAIN SCHEDULES WITH HEAVIER TRAINS.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET NEW YORK CITY

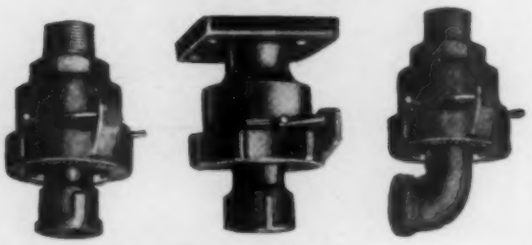






BARCO

EQUIPMENT ALWAYS INSURES FREEDOM *from* FAILURE



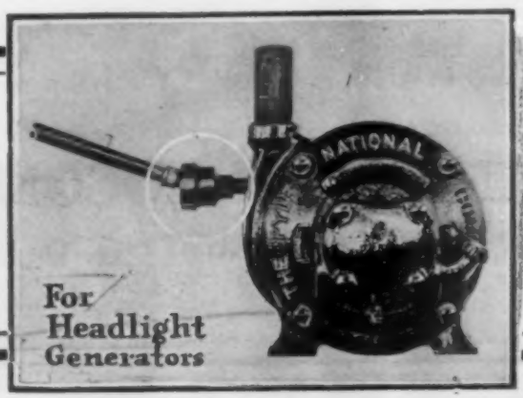
FLEXIBILITY without structural weakness makes Barco flexible joints for air reservoirs, distributing valves, headlight generators, air compressors, and brake cylinder pipes absolutely tight under vibratory stresses, and expansion and contraction, and prevents pipe breakages under extreme conditions of heat or cold.

In addition to the saving in cost of maintenance, both in material and labor effected by the use of Barco Joints, the first cost of Barco Joints is only a little more than the cost of extra heavy unions and fittings otherwise required.

Barco Manufacturing Co.

1801 Winnemac Ave., Chicago, Ill.

In Canada Montreal-Toronto — THE HOLDEN CO., LTD. — In Canada Winnipeg-Vancouver



Baldwin Pacifics Handle Heavy Traffic on the Capital Cities Route

Pacific Type Locomotive for the Capital Cities Route
H. J. WARTHEN, Superintendent Motive Power

Cylinders,	27" x 28"	Water heating surface,	4175 sq. ft.
Drivers, diameter,	75"	Superheating surface,	1078 sq. ft.
Steam pressure,	210 lb.	Weight on drivers,	205,300 lb.
Grate area,	75.8 sq. ft.	Weight, total engine,	332,600 lb.
		Tractive force,	48,580 lb.

Few, if any, railways in the country handle a higher class of passenger traffic than the Richmond, Fredericksburg & Potomac, whose 116 miles of main line connect the Capital Cities of Washington and Richmond.

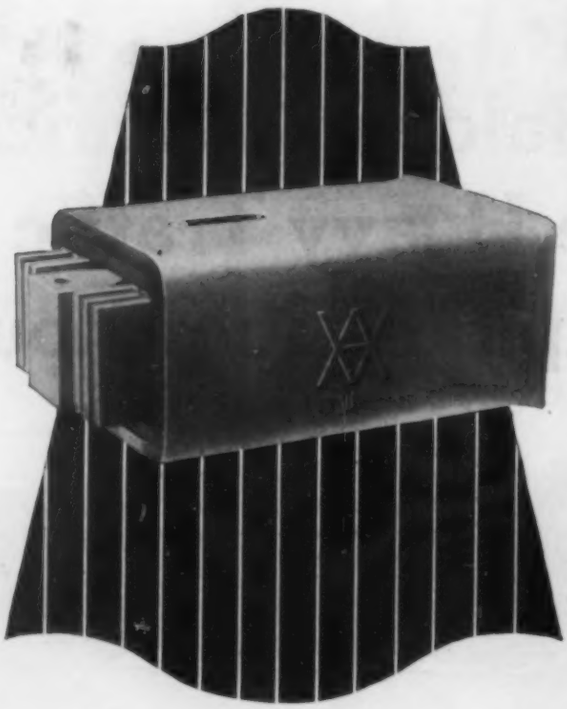
Through trains of the Seaboard Air Line and the Atlantic Coast Line, many of which run between New York and Florida, are handled by this road on schedules calling for an average speed of approximately 40 miles per hour. The line traverses a rolling country, and to make the time with heavy trains requires locomotives of high capacity and unquestioned reliability.

The Capital Cities Route has recently placed in this difficult service, four Baldwin Pacific type locomotives as illustrated above. They are stoker fired, and rank among the most powerful six-coupled locomotives thus far built.

With track conditions permitting heavy wheel loads, the hauling capacity of these locomotives equals that of many eight-coupled locomotives used in main line freight service.

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA



DEPENDABILITY

ANY apparatus to meet popular favor in the steam road field must serve dependably and consistently. Westinghouse type "N" Friction Draft Gears are carefully designed and built to render such a service. Their sturdily constructed housings contain frictional elements, so placed to readily assume the shocks and stress of operation and give a quick positive release.

Initially dependable, all Westinghouse Friction Draft Gears, due to an ingenious feature of renewability, are capable of continuing in efficient active service throughout the life span of several ordinary gears.

There is an "N" type Westinghouse Friction Draft Gear to suit every class of rail service—a high capacity gear where service is rigid, or a gear of less capacity where such amply fills the requirements. The insertion of a simple shim or liner, that constitutes the element of rejuvenation in all type "N" gears, may be repeated indefinitely, and at a nominal cost.

8009

WESTINGHOUSE FRICTION DRAFT GEAR CO.

Pittsburgh, Pa.

General Sales Office, 913 People's Gas Bldg., Chicago, Ill.

Wabash freight train ascending Paris Hill between Hannibal and Moberly, Missouri.

REGISTERED LCS TRADE MARK

THE Duplex Stoker embodies a distinctive method of fuel distribution which assures the ability to deliver coal to the grate just as it is needed to suit varying steam requirements—in small, uniform quantities when the locomotive is working light, or in large uniform quantities when the locomotive is being worked to its full capacity. Under either condition it is possible to obtain proper fuel distribution—as indicated by a clear stack.

The illustration shows a freight train of 2273 gross tons ascending a 1¼% grade at 12 miles per hour. To accomplish this required that the throttle be kept wide open, the reverse lever down in the corner, and that the booster be cut in. Even with the locomotive thus being worked to its full hauling capacity, the stack was kept clear—an indication of Duplex Stoker firing efficiency, now being obtained on over 8600 locomotives of all types.

LOCOMOTIVE STOKER CO.

Manufacturers of Duplex Stokers, Elvin Shovel Type Stokers, Mechanical Coal Pushers

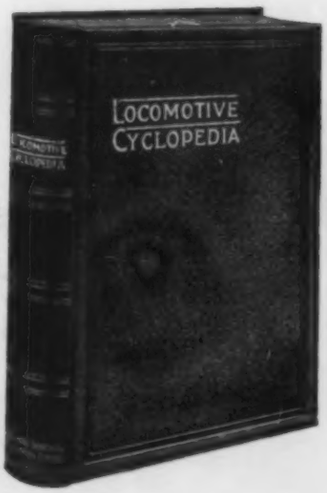
Main Office and Works—30 General Robinson Street, West Northside, PITTSBURGH, PA.

Westinghouse Bldg.
150 Broadway
NEW YORK

Munsey Bldg.
1329 "E" St., N. W.
WASHINGTON

Railway Exchange Bldg.
80 E. Jackson Blvd.
CHICAGO

Breaking All Sales Records



The number of orders received for the week ending March 26 broke all previous Records on Cyclopedia sales.

Ready April 15th

There are ten reasons why—

1. New Shops and Engine Terminals Section.
2. Section on Internal Combustion Locomotives.
3. Descriptions of Motive Power Units of Self-Propelled Cars.
4. Section on Automatic Train Control.

$5. The Price.

6. Tables of Dimensions of Typical Recent Locomotives.
7. Electrification Section Amplified.
8. More complete data on three-cylinder locomotives and single expansion articulated locomotives.
9. New Power shown includes the Horatio Allen; the 2-8-4; the 2-10-4; the 4-10-2 and the 4-12-2 designs.
10. Descriptions of such new developments as high-pressure boilers, four-wheeled trailer trucks and the application of boosters thereon, tender boosters and auxiliary locomotives on four- and six-wheel tender trucks, etc., etc.

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EXHAUST steam going out the stack is dissipated in the atmosphere and wasted.

Once it passes out the stack, it's gone. There is no possible way of saving it and the heat contained (representing coal burned) is lost.

The Elesco feed water heater reclaims a portion of this exhaust steam for heating the feed water while on its way to the boiler.

This puts hot water in the boiler. No additional fuel has been required to raise its temperature. The firebox has had less work to do.

By utilizing exhaust steam, the Elesco feed water heater works for the firebox.

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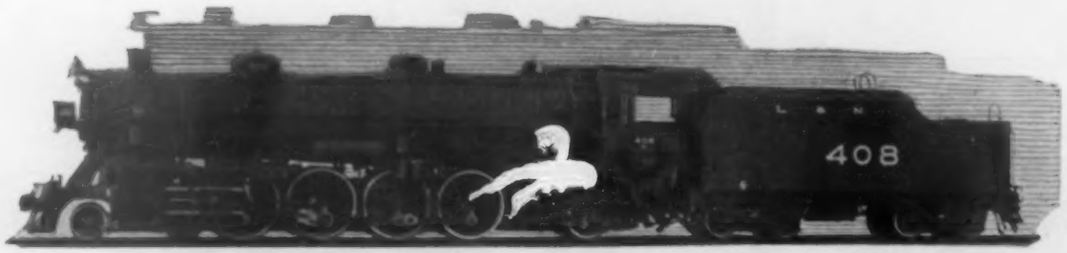
FEED WATER HEATERS SUPERHEATERS EXHAUST STEAM INJECTORS



Eight locomotives like this mountain type were built by The Baldwin Locomotive Works for the Louisville & Nashville Railroad. All are equipped with Vanadium Cast Steel Frames

Provide the Needed Frame Properties Without Excessive Weight or Size

TO obtain in a carbon steel frame the great strength and resistance to shocks and dynamic stresses that are possessed by any Vanadium Cast Steel Frame would necessitate a carbon steel frame much larger in section and heavier in weight.

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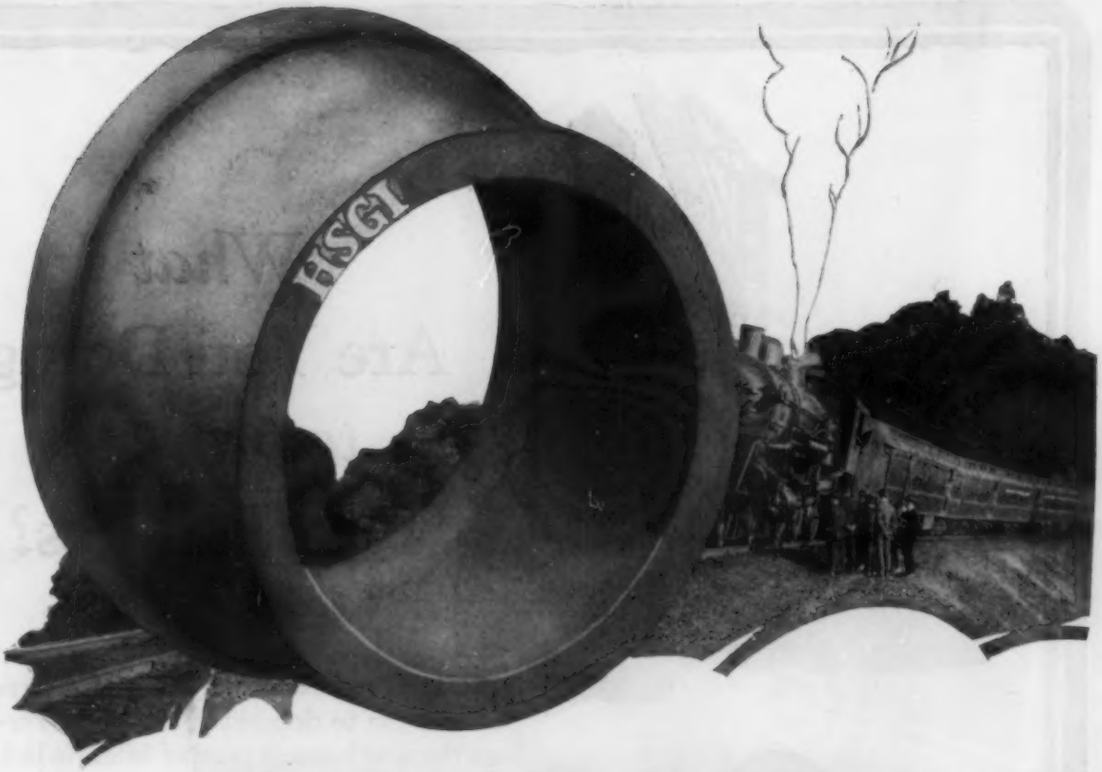

Fewer Road Failures

THE greater the tractive effort, the higher the cost for every locomotive failure.

Defective main and side rod bearings are responsible for a big percentage of delays and failures out on the road.

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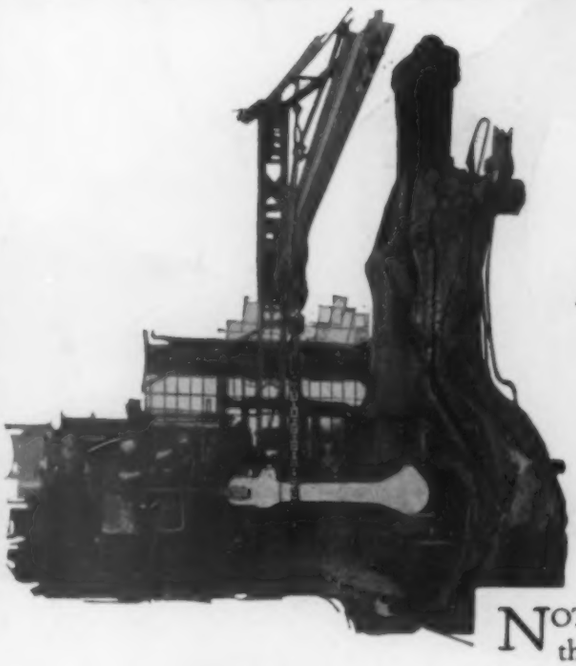

What Are You Doing *to prevent* Rod Failures?

NOT all rod failures are due to defects that can be detected by inspection. Perhaps the most frequent cause of failure is lack of resistance to fatigue—the eventual surrender of a carbon steel forging to the severe stresses to which it is subjected.

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There is an Agathon Alloy Steel particularly suited for this purpose which is stronger and tougher than carbon steel. It resists fatigue exceptionally well.

Replace those inadequate carbon steel forgings with parts of Agathon Alloy Steel and you are safe-guarded against costly forging failures.

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REMARKABLE mileage records made by "Pet" locomotives look good on reports, but add little to operating efficiency, for only a consistent high average of all your power, will result in lower cost per mile and real economy.

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To date there are 1430 locomotives equipped.

Thirty-nine new locomotives now under construction will also be Hulson Equipped.

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Fabricated that's the difference!

The only metal that will successfully withstand the terrific impact and vibration of the moving parts of your locomotives is wrought iron—built up of layer on layer of beaten iron, welded and forged into a homogeneous mass of super-strong, shock-resisting metal.

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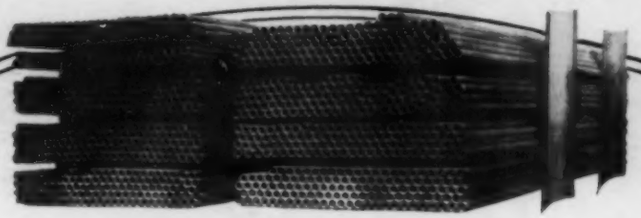

Where minutes count!

THUNDERING over the rails with terrific speed from the great metropolitan centers of the East to those of the West, through miles and miles of mountain peaks and barren desert wastes, the great monster of power can have no uncertain or doubtful equipment in its make-up—every minute counts!

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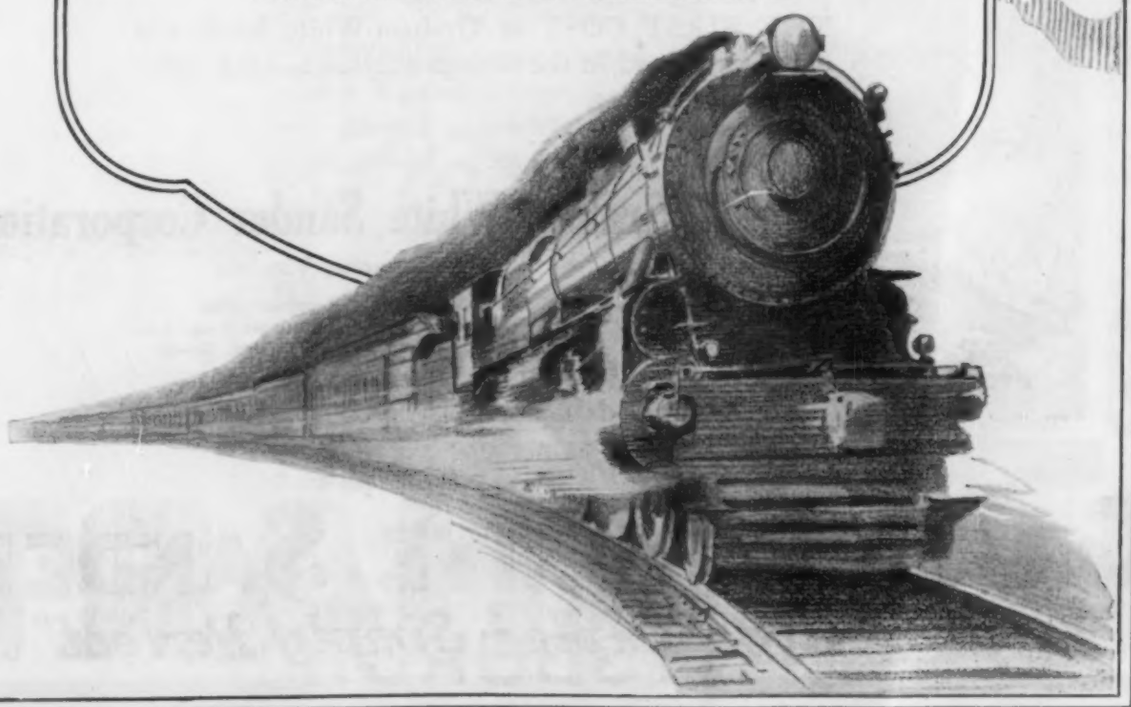
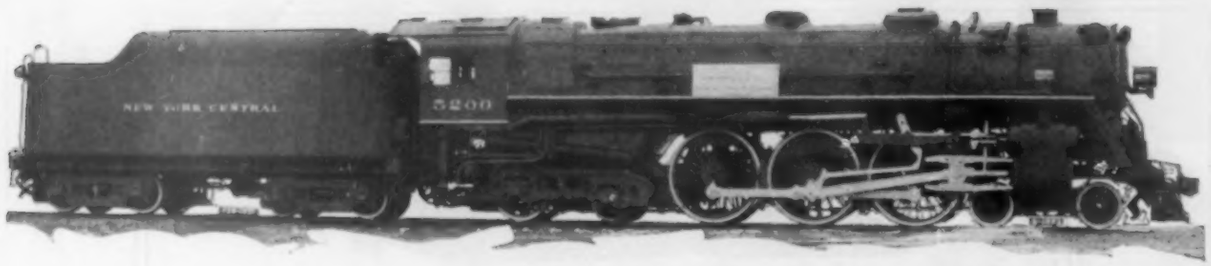




Under The Jacket —

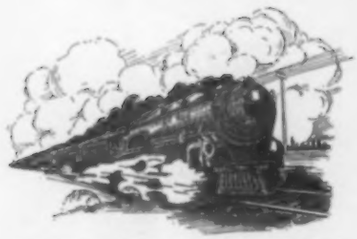
of The New "Hudson Type" Locomotive

THE Beauty of the new "Hudson Type" locomotive is enhanced by the straight jacket lines, uninterrupted by excessive external piping.

UNDER THE JACKET of this locomotive Graham-White Sanders have been applied to insure against loss of tractive effort.

IT IS SAFE to apply Graham-White Sanders under the jacket because a momentary high pressure blast before and after each sanding operation cleans the pipes, eliminates the necessity of pounding and probing and guarantees effective sanding.

THE FIRST COST of Graham-White Sanders is quickly returned in the savings effected in sand, labor and sander repairs.



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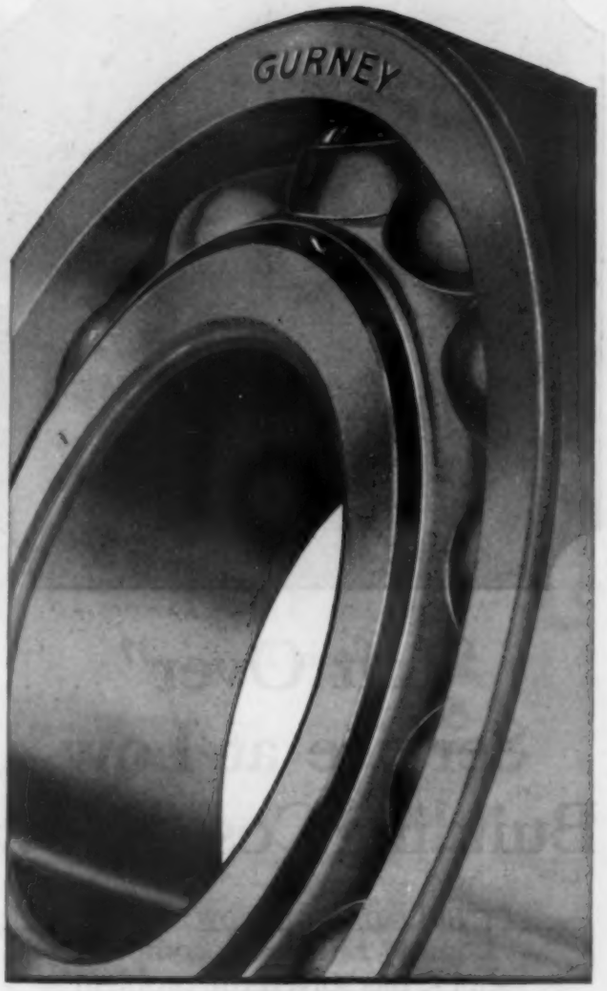

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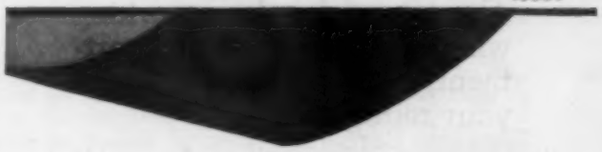

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BALL BEARINGS

It Rained Every Day from November 10th Until December 4th, but the "American" Locomotive Ditcher Kept Right on Ditching and Cleaning Up Slides

The "AMERICAN" Locomotive Ditcher shown above belongs to the Southern Pacific Co. and is shown at work near Jetty, Oregon. Working conditions were very bad and the weather execrable, but the machine cleaned up a big blue clay slide at Wheeler, cleaned lots of ditch, moved stumps, logs and rocks. Did good work and saved money for the railroad. Write for illustrated booklet.

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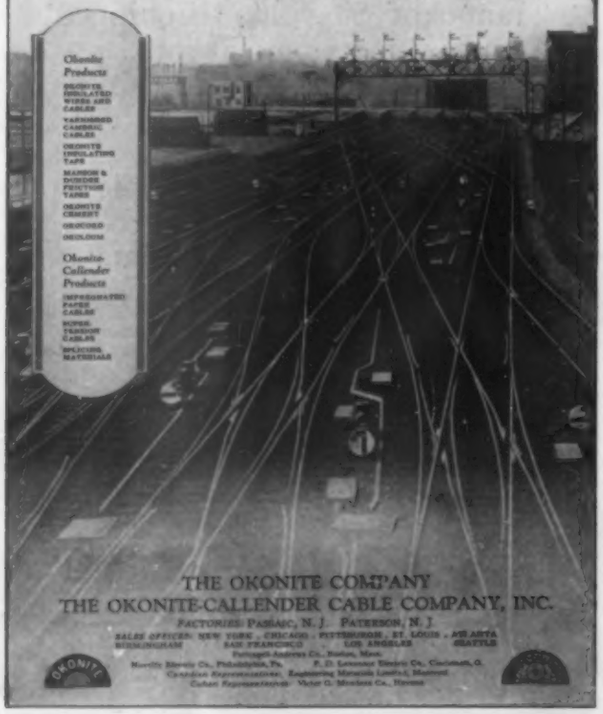

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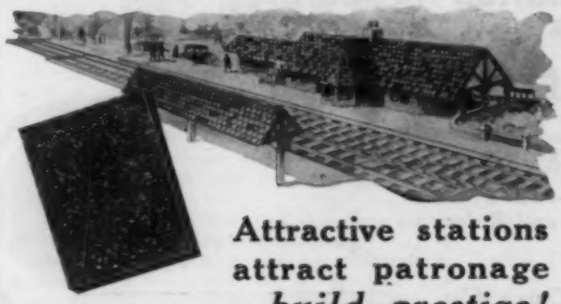

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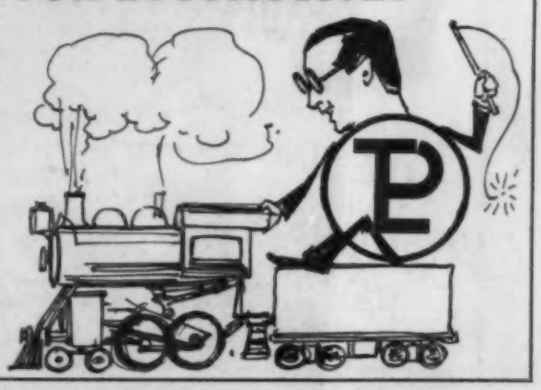

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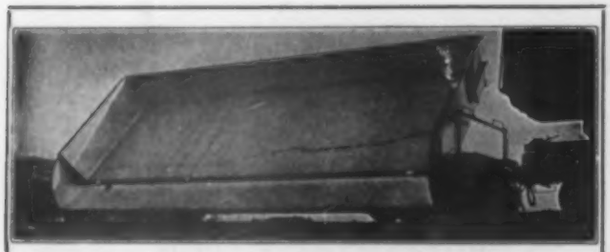

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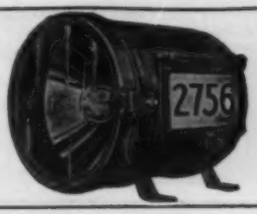

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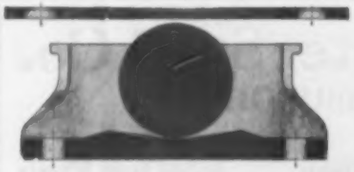

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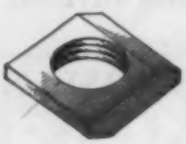

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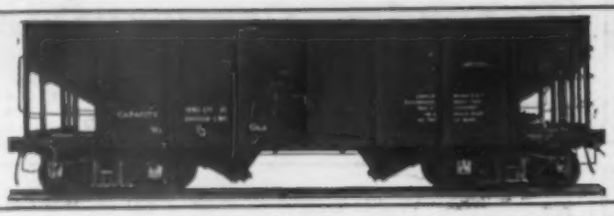

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For location of advertisements of manufacturers listed in the Buyers' Index, see Alphabetical Index on the last white page.

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Prest-O-Lite Co.

Acetylene Generating Apparatus.
Oxweld Acetylene Co.

Air Brake.
Westinghouse Air Brake Co.

Air Reservoir Joints — (See Joints, Air Reservoir).

Air Reservoirs.
Leader Iron Works.

Alloy, Steel.
Andrews Steel Co., The
Bourne-Fuller Co., The.
Central Alloy Steel Corp.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Arresters, Lightning.
Electric Service Supplies Co.
P. & M. Co., The.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Ash Conveyors.
Industrial Works.
Galion Iron Works, The.

Ash Handling Machinery.
Industrial Works.

Ash Handling Stations.
Galion Iron Works, The.

Auxiliary Locomotive.
Bethlehem Steel Co.

Axles, Car and Locomotive.
American Locomotive Co.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Midvale Company, The
Standard Steel Works Co.

Ballast Discers.
Fairmont Ry. Motors, Inc.

Barges, Steel.
American Bridge Co.

Bars, Concrete, Reinforcing.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Jos. T.
Truscon Steel Co.

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Bourne-Fuller Co., The.
Carnegie Steel Co.
Central Alloy Steel Corp.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Bars, Nickel.
American Mond Nickel Co.

Batteries, Storage.
Safety Car Heating & Lighting Co.

Bearings, Axles, Motor and Push Car.
Buda Co., The.
Fairmont Railway Motors, Inc.

Bearings, Ball.
Martin Rockwell Corp.

Bearings, Center.
Chicago Ry. Equipment Co.
Koppel Industrial Car & Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Stucki Co., A.
Symington Co., The
Woods & Co., Edwin S.

Bearings, Journal.
Magnus Co., Inc.

Bearings, Roller.
Fairmont Ry. Motors, Inc.
Timken Roller Bearing Co., The.

Bearings, Roller Side.
Q & C Co., The.
Standard Coupler Co.

Bearings, Side.
American Steel Foundries.
Chicago Ry. Equipment Co.
Fort Pitt Malleable Iron Co.
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Standard Car Truck Co.
Stucki Co., A.
Wine Ry. Appliance Co.
Woods & Co., Edwin S.

Benders, Rail.
Buda Co., The.
Q & C Co., The.

Bending and Straightening Machines.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Andrews Steel Co., The
Bourne-Fuller Co., The.
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Midvale Co., The
Ryerson & Son, Jos. T.

Bins, Steel.
Leader Iron Works.

Blocks, Chain.
Yale & Towne Mfg. Co.

Blocks, Creosoted.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Blooms, Steel.
Andrews Steel Co., The
Bourne-Fuller Co., The.
Carnegie Steel Co.
Central Alloy Steel Corp.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blow Off Line Joints, Roundhouse (See Joints, etc.).

Blowpipes.
Oxweld Acetylene Co.

Bodies, Bus.
Baker-Raulang Co., The.

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works.

Boilers, Scale Proof.
Industrial Works.

Boilers, Water Tube.
Babcock & Wilcox Co.

Bolster, Steel.
American Steel Foundries.
Bradford Corp.
Buckeye Steel Castings Co.
Koppel Industrial Car & Equipment Co.
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Bolts and Nuts.
Bethlehem Steel Co.
Bourne-Fuller Co., The.
Graham Bolt & Nut Co.
Ryerson & Son, Joseph T.
Standard Safety Nut Corp.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Bethlehem Steel Co.
Bourne-Fuller Co., The.
Illinois Steel Co.
Inland Steel Co.

Bonds, Propulsion Type.
Ohio Brass Co., The

Bonds, Rail.
American Steel & Wire Co.
Ohio Brass Co., The

Bonds, Signal.
Ohio Brass Co., The

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Simmons-Boardman Publishing Co.

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Boring and Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring and Turning Mills, Vertical.
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Q & C Co., The.
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Schaefer Equipment Co.

Brake Heads.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Brake Jaws.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Brake Shoes.
American Steel Foundries.
Brill Co., J. G., The.
Fort Pitt Malleable Iron Co.
Wheel Truing Brake Shoe Co.

Brake Shoes, Wheel Truing.
Wheel Truing Brake Shoe Co.

Brake Steps, Safety.
Irving Iron Works.

Brakes, Air.
Westinghouse Air Brake Co.

Brakes, Electric.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Malleable & Steel Castings Co.
Wine Ry. Appliance Co.

Bridge Builders.
American Bridge Co.
Arnold Engineering Co., The.
Bethlehem Steel Co.

Bridge Stringers—(See Stringers, Bridge.)

Buckets, Clam Shell.
Industrial Works.
Orton & Steinbrenner Co.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Works.
Orton & Steinbrenner Co.

Buckets, Orange Peel.
Industrial Works.

Buffers, Friction.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Material.
Celotex Co., The.

Buildings, Iron, Steel and Steel Concrete.
American Bridge Co.
Arnold Engineering Co., The.
McClellan & Junkersfeld Inc.
Robinson Co., Dwight P.

Buildings, Portable Steel.
Truscon Steel Co.

Buildings, Steel.
American Bridge Co.

Bulldozers.
Ryerson & Son, Joseph T.

Buzzer Systems.
Electric Service Supplies Co.

Cable Accessories, Electrical.
Electric Service Supplies Co.

Cables, Electric.
American Steel & Wire Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways).

Calipers.
Lufkin Rule Co., The.

Car Lighting Equipment — (See Lighting, Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.

Car Parts and Appliances.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Car Parts, Freight.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Car Repairs.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Car Steps, Safety.
Irving Iron Works.

Cars, Ballast.
Bethlehem Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Dump.
Bethlehem Steel Co.
Clark Car Co.
Differential Steel Car Co.
Koppel Industrial Car & Equipment Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Cars, Freight (New and Repaired).
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Electric Motive Co.

Cars, Hand, Push, Motor, Inspection.
Buda Co., The.
Fairmont Railway Motors, Inc.

Cars, Industrial.
Bethlehem Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Railway Motors Corp.

Cars, Motor (Weed Mower).
Clark Car Co.
Fairmont Ry. Motors, Inc.

Cars, Ore.
Clark Car Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Cars, Passenger.
Electro Motive Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Cars, Power Units.
Electro Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

BUYERS INDEX

For location of advertisements of manufacturers listed in the Buyers Index, see Alphabetical Index on the last page next to cover

Cars, Second-Hand.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Electro Motive Co.

Cars, Spreader.
Western Wheeled Scraper Co.
Jordan Co., O. F.

Cars, Tank.
Bethlehem Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Cars, Trailer.
Buda Co., The.
Fairmont Ry. Motors, Inc.

Cars, Velocipede.
Buda Co., The.

Castings, Brass and Bronze.
Magnus Co., Inc.
Union Switch & Signal Co.

Castings, Gray Iron.
American Locomotive Co.
Baldwin Locomotive Works.
Fulton Iron Works Co.
Locomotive Finished Material Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron and Steel.
Industrial Works.

Castings, Malleable Iron.
Fort Pitt Malleable Iron Co.
Koppel Industrial Car & Equipment Co.
National Malleable & Steel Castings Co.
P. & M. Co., The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Castings, Steel.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Edgewater Steel Co.
Koppel Industrial Car & Equipment Co.
Midvale Co., The
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Union Switch & Signal Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Union Steel Casting Co.

Castings, Steel Vanadium.
Union Steel Casting Co.

Center Plates—(See Bearings, Center).

Center Sills.
Bradford Corp.

Chain, Tapes.
Lufkin Rule Co., The.

Chemicals.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chucks, Lathe.
Ryerson & Sons, Jos. T.

Circuit Breakers.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Flanging.
Ryerson & Sons, Jos. T.

Clamps, Guard Rail.
Buda Co., The.
Q & C Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
National Malleable & Steel Castings Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Cleaners, Flue.
Ryerson & Sons, Jos. T.

Coach and Coach Yard Steam Joints—(See Joints, Etc).

Coal Ore and Ash Handling Machines.
Gallon Iron Works, The.
Industrial Works.
Orton & Steinbrenner Co.

Coaling Stations.
American Bridge Co
Gallon Iron Works, The.

Cocks, Angle.
Westinghouse Air Brake Co.

Combination Crane Pile Drivers.
Industrial Works.

Compressors, Air.
Worthington Pump & Mchy. Corp.

Concrete, Reinforcement.
American Steel & Wire Co.
Ryerson & Sons, Jos. T.

Condensing Apparatus.
Worthington Pump & Machinery Corp.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Connections, Truck Lever.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Connectors, Automatic, T. P. —(See Train Connectors, Automatic).

Connectors, Electrical.
Electric Service Supplies Co.
Ohio Brass Co., The
Westinghouse Elec. & Mfg. Co.

Contraction Joint.
Truscon Steel Co.

Control Devices, Train Speed.
General Railway Signal Co.
Union Switch & Signal Co.

Controllers, Electrical.
American Brown Boveri Electric Corp.
Westinghouse Elec. & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Works.
Orton & Steinbrenner Co.

Conveyor, Ash — (See Coal, Ore and Ash Handling Mach.).

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.
Westinghouse Air Brake Co.

Coupler Pockets—(See Draft Yokes).

Couplers, Radial.
Ohio Brass Co., The

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Covering, Boat, Rattan—(See Rattan).

Cranes, Ballast Cleaning.
Industrial Works.

Cranes, Crawling Shovels and Draglines.
Industrial Works.

Cranes, Diesel.
Industrial Works.

Cranes, Electric Traveling.
Industrial Works.
Sellers & Co., Inc., Wm.

Cranes, Electric, Industrial Truck Mounted.
Baker-Raulang Co., The.

Cranes, Gantry.
Industrial Works.
Orton & Steinbrenner Co.

Cranes, Gasoline.
Industrial Works.

Cranes, Jib.
Industrial Works.
Yale & Towne Mfg. Co.

Cranes, Locomotive.
American Hoist & Derrick Co.
Industrial Works.
Ohio Locomotive Crane Co.
Orton & Steinbrenner Co.

Cranes, Pillar.
Industrial Works.

Cranes, Portable.
American Hoist & Derrick Co.
Industrial Works.
Orton & Steinbrenner Co.

Cranes, Tractor.
Industrial Works.
Orton & Steinbrenner Co.

Cranes, Tractor Crawling.
Industrial Works.

Cranes, Transfer.
Industrial Works.

Cranes, Traveling.
Yale & Towne Mfg. Co.

Cranes, Wrecking.
Industrial Works.
Orton & Steinbrenner.

Crank Pins — (See Pins, Crank).

Creosote.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Crossheads and Shoes.
Barco Mfg. Co.

Crossing-Gates.
Buda Co., The.

Crossings — (See Frogs and Crossings).

Cross Arms.
American Bridge Co.

Cross Ties.
Century Wood Preserving Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Cross Ties, Creosoted.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Crushers, Coal.
Orton & Steinbrenner Co.

Culverts.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Armco Culvert & Flume Mfrs. Assn.

Curb Bars.
Truscon Steel Co.

Cutters, Flue.
Ryerson & Sons, Jos. T.

Cutting and Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Elec. & Mfg. Co.

Cyclopedias, Railway.
Simmons-Boardman Publishing Co.

Cylinder Parts (Finished and Rough).
Locomotive Finished Material Co.

Cylinders, Gas, Acetylene, Etc.
National Tube Co.

Cylinders, Locomotive.
Fulton Iron Works Co.
Locomotive Finished Material Co.

Decking, Car.
Duncan Lumber Co.

Derails.
Q & C Co., The.

Derricks.
Carnegie Steel Co.
Industrial Works.

Devices, Safety, Motor Car.
Fairmont Railway Motors, Inc.

Diesel Electric Power Plants.
Fooe Gas Engine Co., The.

Digging Machines.
Buda Co., The.

Disinfectants.
Chipman Chemical Engineering Co.
West Disinfecting Co.

Ditching Machinery.
American Hoist & Derrick Co.
Industrial Works.
Jordan Co., O. F.
Orton & Steinbrenner Co.

Dividers.
Lufkin Rule Co., The.

Door Fixtures—(See Fixtures, Car Door).

Door, Locomotive, Fire-Box.
Franklin Railway Supply Co.

Doors, Car.
Camel Co.
Miner, W. H.
Wine Ry. Appliance Co.

Doors, Grain.
Exchange Sawmills Sales Co.

Draft Arms.
American Steel Foundries.
Bradford Corp.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gears.
American Steel Foundries.
Bradford Corp.
Fort Pitt Malleable Iron Co.
Miner, W. H.
Symington Co., The.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.
Westinghouse Friction Draft Gear Co.

Draft Gear Attachments.
Symington Co., The

Draft Yokes.
American Steel Foundries.
Miner, W. H.
National Malleable & Steel Castings Co.
Symington Co., The
Universal Draft Gear Attachment Co.

Drawbar Centering Device.
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.

Dredging Machinery.
Industrial Works.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.

Drills, Bonding, Track.
Buda Co., The.

Drills, Chipping.
Syntron Co.

Drills, Concrete.
Syntron Co.

Drills, Earth.
Buda Co., The.

Drills, Electric.
Syntron Co.

Drills, Hammer, Electric.
Syntron Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Ry. Appliance Co.

Dynamos — (See Generators, Electric).

Edge Protector.
Truscon Steel Co.

Electrical Instruments.
Weston Electrical Instrument Corp.
Electric Service Supplies Co.
Ohio Brass Co., The

Electrical Supplies.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
McClellan & Junkersfeld, Inc.
Ohio Brass Co., The
Robinson & Co., Dwight P.
Westinghouse Elec. & Mfg. Co.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers and Contractors.
Arnold Engineering Co., The.
Battey & Kipp.
Day & Zimmerman, Inc.
Ferguson Co., H. K.
Hunt Co., Robert W.
McClellan & Junkersfeld, Inc.
Muhlfeld, John E.
Robinson Co., Dwight P.

Engineers, Construction.
Arnold Engineering Co., The
Battey & Kipp.
Day & Zimmerman, Inc.
Ferguson Co., H. K.
McClellan & Junkersfeld, Inc.
Robinson & Co., Dwight P.

Engineers, Consulting, Civil, Elec., Hydraulic, Mech.
Arnold Engineering Co., The.
Battey & Kipp.
Buckeye Jack Mfg. Co.
Day & Zimmerman, Inc.
Ferguson Co., H. K.
Hunt Co., Robert W.
Muhlfeld, John E.
Robinson & Co., Dwight P.

Engineers, Inspecting.
Arnold Engineering Co., The.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
Robinson & Co., Dwight P.

Engineers Valuation.
Arnold Engineering Co., The.
Hunt Co., Robt. W.
Robinson & Co., Dwight P.

Engines, Crude and Fuel Oil.
Fooe Gas Engine Co., The.
Worthington Pump & Mchy. Corp.

Engines, Diesel.
Fooe Gas Engine Co., The.

Engines, Gas and Gasoline.
Buda Co., The.
Worthington Pump & Mchy. Co.

Engines, Gasoline.
Fairmont Railway Motors, Inc.

Engines, Hoisting.
American Hoist & Derrick Co.
Continental Motors Corp.
Industrial Works.
Orton & Steinbrenner Co.

Expanders, Tube.
Ryerson & Son, Joseph T.

Fans, Exhaust and Ventilating.
General Electric Co.

For location of advertisements of manufacturers listed in the Buyers Index, see Alphabetical Index on the last page next to cover

BUYERS INDEX

Fasteners, Car Door.
National Malleable & Steel Castings Co.

Fare Boxes and Registers.
Electric Service Supplies Co.

Fasteners, Car Door.
Arnold Engineering Co., The.
Camel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.

Fencing, Wire — (See Wire Fence).

Fencing, Wood.
Duncan Lumber Co.

Ferro Molybdenum.
Vanadium Corp. of America.

Ferro Tungsten.
Vanadium Corp. of America.

Ferro Vanadium.
Vanadium Corp. of America.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works.
Locomotive Firebox Co.

Fittings, Air Brake.
Westinghouse Air Brake Co.

Fittings, Cast Iron.
Crane Co.

Fittings, Malleable.
Crane Co.

Fixtures, Car Door.
Camel Co.
Chicago Ry. Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flanged Fittings.
Crane Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
Electric Service Supplies Co.
Westinghouse Elec. & Mfg. Co.

Flooring.
Exchange Sawmills Sales Co.
Jennison-Wright Co.

Flooring, Bus.
Tuco Products Corp.

Flooring, Car.
Tuco Products Corp.

Flooring Compositions.
Tuco Products Corp.

Flooring, Composition Car.
Tuco Products Corp.

Flooring, Steel.
Irving Iron Works.

Flooring, Wood.
Central Coal & Coke Co.
Century Wood Preserving Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters — (See Cutters, Flue).

Flues, Boiler — (See Tubes, Boiler).

Flue Shop Equipment.
Ryerson & Son, Jos. T.

Flux, Welding.
Oxweld Acetylene Co.

Forges, Rivet Heating.
Ryerson & Son, Jos. T.

Forgings.
American Bridge Co.
American Steel Foundries.
Andrews Steel Co., The
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Illinois Steel Co.
Johnson & Co., J. R.
Koppel Industrial Car & Equipment Co.
Midvale Co., The
Pressed Steel Car Co.
Tuco Products Corp.
Universal Draft Gear Attachment Co.

Forgings, Drop.
General Railway Signal Co.
Union Switch & Signal Co.

Frames, Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Union Steel Casting Co.

Frames, Motor Car.
Fairmont Railway Motors, Inc.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Franklin Railway Supply Co., Inc.
Koppell Industrial Car & Equipment Co.
Pressed Steel Car Co.
Symington Co., The.

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works.
Union Steel Casting Co.

Frogs, Wrecking.
Buda Co., The.

Frogs and Crossings.
Bethlehem Steel Co.
Buda Co., The.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Chicago Ry. Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Rivet Heating—(See Forges, Rivet Heating).

Gage Testers—(See Testers, Gage).

Gages, Wheel Press Recording.
Ashton Valve Co.

Gates, Crossing.
Buda Co., The,

Gauges, Depth, Thickness and Center.
Lufkin Rule Co., The.

Gauges, Track.
Buda Co., The.

Gear and Pinions.
American Steel Foundries.
Tuco Products Corp.
Westinghouse Elec. & Mfg. Co.

Gear Blanks, Rolled Steel.
Standard Steel Works Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Acetylene Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Electric Service Supplies Co.
General Electric Co.
Sunbeam Elec. Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Glass, Wire.
Mississippi Wire Glass Co.

Graphite, Lubricating.
Franklin Ry. Oil Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates, Locomotive.
Hulson Grate Co.

Grating Steel.
Irving Iron Works.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.
Ryerson & Son, Jos. T.

Grinders, Portable.
Buda Co., The.

Grinding Machines.
Sellers & Co., Inc., Wm.

Guard, Rail.
Buda Co., The.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rail (One Piece).
Bethlehem Steel Co.
Ramapo Ajax Corp.

Guard, Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Symington Co., The.

Guards, Incandescent Lamp.
Electric Service Supplies Co.

Hammers, Drop.
Sellers & Co., Inc., Wm

Hammers, Steam.
Industrial Works.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Car Door—(See Fixtures, Car Door).

Headlight Reflectors and Cases.
Buda Co., The.
Electric Service Supplies Co.
Sunbeam Elec. & Mfg. Co.

Headlight Repair Parts, Electric.
Buda Co., The.
Electric Service Supplies Co.
Sunbeam Elec. Mfg. Co.

Headlights, Electric.
Electric Service Supplies Co.
Sunbeam Elec. Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Heaters, Electric Rivet.
American Hoist & Derrick Co.

Heaters, Feedwater.
Superheater Co., The.

Heaters, Feedwater Locomotive.
Worthington Pump & Mchy. Corp.

Heaters, Feedwater, Stationary.
Worthington Pump & Mchy. Corp.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Safety Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Ry. Appliance Co.

Heating and Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

Hoisting Machinery.
American Bridge Co.
Industrial Works.
Orton & Steinbrenner Co.

Hoists, Chain.
Ryerson & Son, Joseph T.

Hoists, Electric.
American Hoist & Derrick Co.
Yale & Towne Mfg. Co.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Hose, Tender.
Westinghouse Air Brake Co.

Ingots.
Andrews Steel Co., The
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.

Injectors, Exhaust Steam.
Superheater Co., The.

Inspection of Material and Equipment — (See Engineers, Inspection).

Insulating Lumber.
Celotex Co., The.

Insulation, Car.
Celotex Co., The.
Lehon Co., The.
Nelson Mfg. Co., H. F.
Tuco Products Corp.

Insulation, Electrical.
Electric Service Supplies Co.

Insulation, Heat.
Celotex Co., The.
Miner, W. H.
Nelson Mfg. Co., H. F.

Insulators, Electrical.
Ohio Brass Co., The

Insulators, Porcelain.
Ohio Brass Co., The

Insulators, Third Rail.
Ohio Brass Co., The

Interlocking Plant Equipment.
Union Switch & Signal Co.

Iron, Chain.
Lockhart Iron & Steel Co.

Iron, Charcoal.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.

Iron Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.
Illinois Steel Co.
Lockhart Iron & Steel Co.

Iron, Refined.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron Staybolt—(See also Staybolts).
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Jacks.
Buda Co., The.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Rail.
American Steel Foundries.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air and Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Journal Boxes and Lids.
American Steel Foundries.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Keys, Brake Shoe.
Bradford Corp.
Union Spring & Mfg. Co.

Knuckles, Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
Brooks & Co., Clarence.

Ladders, Steel Car.
Wine Ry. Appliance Co.

Lamps, Incandescent.
Electric Service Supplies Co.
Westinghouse Elec. & Mfg. Co.

Lath, Metal.
American Rolling Mill Co., The.
General Fireproofing Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Turret.
Sellers & Co., Inc., Wm.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lighting Equipment, Car.
Safety Car Heating & Lighting Co.

Lighting Fixtures and Systems.
Electric Service Supplies Co.
Safety Car Heating & Lighting Co.

Line Material.
Electric Service Supplies Co.
Ohio Brass Co., The

Lining, Car.
Duncan Lumber Co.

Lock Nuts (See Nut Locks).

Locks and Padlocks.
Yale & Towne Mfg. Co.

Locomotives, Contractors'.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works

Locomotives, Gas-Electric.
Electro Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Oil, Engine, Electric Driven.
Baldwin Locomotive Works.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Rebuilt.
American Locomotive Co.

Loco. Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Long-Distance Telephone Service
American Telephone & Telegraph Co.

Lubricants, Oil and Grease.
Franklin Ry. Oil Co.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rods.
Q & C Co., The.

Lumber.
Central Coal & Coke Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.
West Coast Lumber Trade Extension Bureau.

BUYERS INDEX

For location of advertisements of manufacturers listed in the Buyers Index, see Alphabetical Index on the last page next to cover

Lumber, Creosoted.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison-Wright Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Magnets, Lifting.
Industrial Works.

Mechanical Draft Apparatus—(See Heating and Vent. App.).

Melters, Snow, Electric.
Q & C Co., The.

Metal Tile and Domes.
Truscon Steel Co.

Meters, Water and Oil.
Worthington Pump & Machinery Co.

Micrometers.
Lufkin Rule Co., The.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Molybdenum Metal.
Vanadium Corp. of America.

Monorail Switches and Turntables.
Yale & Towne Mfg. Co.

Motors, Electric.
Westinghouse Elec. & Mfg. Co.

Motors and Generators.
Fairbanks, Morse & Co.

Motors, Gasoline.
Continental Motors Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nitrogen.
Linde Air Products Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nuts—(See Bolts and Nuts).

Nut Locks.
Graham Bolt & Nut Co.
Grip Nut Co.
Reliance Mfg. Co.
Standard Safety Nut Corp.

Office Appliances.
General Fireproofing Co.

Oil Cups.
Crane Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oils, Lubricating.
Franklin Ry. Oil Co.

Oxy-Acetylene Apparatus, Welding, Etc.
Oxweld Acetylene Co.

Oxygen, Gas.
Linde Air Products Co.

Packing, Cylinder and Valve Ring.
Hunt-Spiller Mfg. Corp.
Locomotive Finished Material Co.

Packing, Soft.
Crane Co.

Paints.
Chipman Chemical Engineering Co.
Lehon Co., The
Nelson Mfg. Co., B. F.

Paint, Metal, Protective.
Nelson Mfg. Co., B. F.

Paper, Car Lines (See Car Liners, Paper).

Paper, Sheathing.
Lehon Co., The.
Nelson Mfg. Co., B. F.

Pile Drivers.
Industrial Works.
Orton & Steinbrenner Co.

Piling.
Duncan Lumber Co.

Piling, Creosoted.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison-Wright Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Piling, Sheet Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Pins, Center.
Miner, W. H.

Pins, Coupler, Knuckle.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works.
Johnson & Co., J. R.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.

Pipe, Steel, Signal.
National Tube Co.

Pipe, Wrought Iron.
Reading Iron Co.

Planers.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Plaster Base.
Celotex Co., The.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center — (See Bearings, Center).

Plates, Iron and Steel.
American Rolling Mill Co., The.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plates, Nickel.
American Mond Nickel Co.

Plates, Tie.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
National Malleable & Steel Castings Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Irving Iron Works.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Jordan Co., O. F.
Q & C Co., The.

Poles.
Central Coal & Coke Co.
Duncan Lumber Co.

Poles, Creosoted.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Poles, Signal.
Union Switch & Signal Co.

Poles, Steel, Tubular.
National Tube Co.

Posts.
Duncan Lumber Co.

Posts, Bumping.
Buda Co., The.

Posts, Steel Fence.
American Steel & Wire Co.
Inland Steel Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
McClellan & Junkersfeld, Inc.
Muhlfeld, John E
Robinson & Co., Dwight P.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.

Preservatives, Wood.
Century Wood Preserving Co.
Chipman Chemical Engineering Co.
General Fireproofing Co.
Jennison-Wright Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Pressed Steel Repair Parts.
Koppel Industrial Car Equipment Co.

Presses, Wheel.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pumps and Pumping Machinery.
Worthington Pump & Mchy. Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Locomotive Coal.
Locomotive Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Racks, Hat and Baggage.
Sellers & Co., Inc., Wm.

Rail Bonds.
American Steel & Wire Co.
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co., The.
Westinghouse Elec. & Mfg. Co.
Union Switch & Signal Co.

Rail Braces — (See Braces, Rail).

Rail Laying Machines.
Fairmont Ry. Motors, Inc.

Rail, Manganese.
Manganese Steel Rail Co.

Rail Reclamation Equipment.
Ryerson & Son, Jos. T.

Rail Splice Plates — (See Joints, Rail).

Railroad Shops.
Arnold Engineering Co., The.
Robinson & Co., Dwight P.

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Jos. T.

Rails, Relaying.
Hyman-Michaels Co.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Reflectors, Headlight.
Electric Service Supplies Co.
Sunbeam Elec. Mfg. Co.

Refrigerator Car Insulation.
Celotex Co., The.

Refrigerators.
Wine Ry. Appliance Co.

Reinforcings, Concrete.
General Fireproofing Co.

Relays.
Union Switch & Signal Co.

Replacers, Car.
Q & C Co., The.

Replacers, Car and Locomotive.
Buda Co., The.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Riveting Machines.
Sellers & Co., Inc., Wm.

Rivets.
Bourne-Fuller Co.
Inland Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Ryerson & Son, Joseph T.

Rods, Nickel.
American Mond Nickel Co.

Rods, Welding.
Oxweld Acetylene Co.

Roller Bearings—(See Bearings, Roller).

Roof Insulation.
Celotex Co., The.

Roofing, Asphalt Shingles.
Nelson Mfg. Co., B. F.

Roofing, Building.
American Rolling Mill Co., The.
Lehon Co., The.
Nelson Mfg. Co., B. F.

Roofing, Car.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Hutchins Car Roofing Co.
Lehon Co., The.
Nelson Mfg. Co., B. F.

Roofing, Corrugated.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.

Roofing, Tile, Cement.
American Cement Tile Mfg. Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Roofing, Wood.
Exchange Sawmills Sales Co.

Rope, Wire — (See Wire Rope).

Rules, Wood, Steel and Aluminum.
Lufkin Rule Co., The.

Running Boards, Car and Locomotive.
Irving Iron Works.

Runways, Car and Locomotive
Irving Iron Works.

Safety Devices, Motor Car.
Fairmont Railway Motors, Inc.

Saddles, Running Board.
Miner, W. H.

Safe Ends.
National Tube Co.

Safes, Allsteel.
General Fireproofing Co.

Sanders, Electric Locomotive.
Graham-White Sander Corp.

Sanders, Steam Locomotive.
Graham-White Sander Corp.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Corp.

Sash, Steel.
Truscon Steel Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Works.
Q & C Co., The.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Shafting.
Falls Hollow Staybolt Co.
Sellers & Co., Inc., Wm.

Shapers.
Sellers & Co., Inc., Wm.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Truscon Steel Co.

Shapes, Structural.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Shapers.
Ryerson & Son, Joseph T.

Sheathing.
Celotex Co., The.
Duncan Lumber Co.

Sheds, Train.
American Bridge Co.
Arnold Engineering Co., The.

Sheets, Black and Galvanized.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Corrugated.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Carnegie Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Ryerson & Son, Joseph T.

Sheets, Locomotive Jacket.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Inland Steel Co.

Sheets, Nickel.
American Mond Nickel Co.

Sheets, Plain.
Inland Steel Co.

Sheets, Polished and Planished Iron.
American Sheet & Tin Plate Co.

Sheets, Steel.
American Rolling Mill Co., The.
Bethlehem Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Shelving, Steel.
General Fireproofing Co.

Shop Calling Systems—(See Systems, Communications).

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels and Draglines.
Industrial Works.

Shovels, Gas.
Orton & Steinbrenner Co.

Shovels, Scoop.
Wyoming Shovel Works, The.

Siding, Car.
Duncan Lumber Co.

Siding, Corrugated and Plain.
American Rolling Mill Co., The.
American Sheet & Tin Plate Co.
Inland Steel Co.

Signal Accessories.
American Strombos Co.
General Electric Co.
Union Switch & Signal Co.

Signal, Automatic Cab.
Union Switch & Signal Co.

Signal Blades, Enameled Steel.
Union Switch & Signal Co.

For location of advertisements of manufacturers listed in the Buyers Index, see Alphabetical Index on the last page next to cover

BUYERS INDEX

Signals, Crossing.
Union Switch & Signal Co.

Signals, Railway.
Union Switch & Signal Co.

Signs, Destination.
Electric Service Supplies Co.

Slabs, Steel.
Andrews Steel Co., The
Bourne-Fuller Co., The.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm.

Soap, Liquid.
West Disinfecting Co.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Splice Bars, Rail.
Bethlehem Steel Co.

Spreaders.
Jordan Co., O. F.

Spring Plates or Seats.
National Malleable & Steel Castings Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co.
Fort Pitt Spring & Mfg. Co.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works.
Union Spring & Mfg. Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.

Squares, Combination and Try and Mitre.
Lufkin Rule Co., The.

Stacks, Steel.
American Bridge Co.
Leader Iron Works.

Standpipes, Water.
Fairbanks, Morse & Co.

Stands, Switch and Target.
Buda Co., The.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Bethlehem Steel Co.
Bourne-Fuller Co., The.
Falls Hollow Staybolt Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Shovels.
Orton & Steinbrenner Co.

Steel, Alloy.
Andrews Steel Co., The
Bethlehem Steel Co.
Bourne-Fuller Co., The.
Central Alloy Steel Corp.

Steel, Firebox.
Bethlehem Steel Co.
Illinois Steel Co.

Steel, Heat Treated.
Bethlehem Steel Co.

Steel Plate Construction.
Leader Iron Works.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.
Truscon Steel Co.

Steel, Tool.
Bourne-Fuller Co., The.
Illinois Steel Co.
Midvale Co., The
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The.
Rail Joint Co.

Steps, Car (See Car Steps, Safety).

Stokers, Locomotive.
Locomotive Stoker Co.
Standard Stoker Co.

Stringers, Bridge.
Central Coal & Coke Co.
Century Wood Preserving Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Stringers, Bridge, Creosoted.
Century Wood Preserving Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Stringers, Wood.
Duncan Lumber Co.

Superheaters.
Babcock & Wilcox Co.
Superheater Co., The.

Switches, Electric.
Electric Service Supplies Co.
Ohio Brass Co., The
Westinghouse Elec. & Mfg. Co.

Switches and Switch Stands.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Syphons, Locomotive.
Locomotive Firebox Co.

Tamping Machine, Tie.
Syntron Co., The.

Tamping Outfits, Tie.
Syntron Co.

Tanks, Air, Gas, Oil and Water.
American Bridge Co.
American Locomotive Co.
Babcock & Wilcox Co.
Koppel Industrial Car & Equipment Co.
Leader Iron Works.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

Tanks, Water.
American Locomotive Co.
Babcock & Wilcox Co.
Leader Iron Works.

Tape, Insulating.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Tapes, Measuring, Steel, Linen and Cotton.
Lufkin Rule Co., The.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Telephone Service, Long Distance.
American Telephone & Telegraph Co.

Terminals, Railroad.
McClellan & Junkerafeld, Inc.
Robinson & Co., Dwight P.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Thermostats.
Gold Car Heating & Lighting Co.

Tie Tampers, Electric.
Syntron Co.

Ties, Bridge.
Duncan Lumber Co.
Exchange Sawmills Sales Co.

Ties, Steel.
American Bridge Co.

Ties, Wood.
Duncan Lumber Co.
Exchange Sawmills Sales Co.

Tile, Cement, Concrete.
American Cement Tile Mfg. Co.

Timber.
Central Coal & Coke Co.
Duncan Lumber Co.
Exchange Sawmills Sales Co.
International Creosoting & Construction Co.
West Coast Lumber Trade Extension Bureau.

Timber, Creosoted.
Century Wood Preserving Co.
Michigan Wood Preserving Co.
New England Wood Preserving Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Timber, Railway.
Exchange Sawmills Sales Co.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The
Railway Steel Spring Co.
Standard Steel Works Co.

Torches.
Oxweld Acetylene Co.

Track Skates.
Q & C Co., The.

Track Work, Manganese.
Buda Co., The.

Tracks, Industrial.
Yale & Towne Mfg. Co.

Tractors, Industrial.
Baker-Raulang Co., The.
Yale & Towne Mfg. Co.

Trailers, Industrial.
Yale & Towne Mfg. Co.

Train Control Systems.
Union Switch & Signal Co.

Tramways, Wire Rope.
American Steel & Wire Co

Transfer Tables.
American Bridge Co.
Industrial Works.
Nichols & Bro., Geo. P.
Sellers & Co., Inc., Wm.

Transformers.
Westinghouse Elec. & Mfg. Co.

Trap Doors and Fixtures.
Tuco Products Corp.

Traps, Steam.
Crane Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment, Water—(See Water Softening and Purifying).

Trolleys, I-Beam.
Yale & Towne Mfg. Co.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Franklin Railway Supply Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Industrial Electric.
Baker-Raulang Co., The.

Trucks, Trailer.
Franklin Railway Supply Co., Inc.

Truck Frames—(See Frames, Truck).

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Bethlehem Steel Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Stay.
Falls Hollow Staybolt Co.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbines, Steam.
Westinghouse Elec. & Mfg. Co.

Turbo Generators.
Buda Co., The.
Electric Service Supplies Co.
Sunbeam Elec. Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
Ohio Brass Co., The
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bro., Geo. P.

Turntables.
American Bridge Co.
Bethlehem Steel Co.
Industrial Works.
Sellers & Co., Inc., Wm.

Uncoupling Device.
Hutchins Car Rfg. Co.

Underframes, Steel.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.

Valve Pilot, Locomotive.
Cut-off & Speed Recorder Corp.

Valves, Blown and Blow-Off.
Crane Co.

Valves, Brass.
Crane Co.

Valves, Drifting.
Franklin Railway Supply Co., Inc.

Valves, Globe and Gate.
Crane Co.

Valves, Globe, Angle Disc, Gate and Check.
Ohio Brass Co., The

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety and Relief.
Crane Co.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Crane Co.
Gold Car Heating & Lighting Co.

Valves, Throttle.
Bradford Corp.

Varnishes.
Brooks & Co., Clarence.

Ventilators.
Electric Service Supplies Co.

Ventilators, Car.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Wine Ry. Appliance Co.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Reliance Mfg. Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Wine Ry. Appliance Co.

Water Alarms — (See Low Water Alarms).

Waterproofing Materials.
Lehon Co., The.
Nelson Mfg. Co., B. F.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Koppel Industrial Car & Equipment Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.

Weed Burners.
Fairmont Ry. Motors, Inc.

Weed Killer.
Chipman Chemical Engineering Co.
Q & C Co., The

Welding Gas.
Prest-O-Lite Co.

Welding Machines, Acetylene.
Ryerson & Son, Jos. T.

Welding Materials.
Oxweld Railroad Service Co.

Welding Machines, Electric.
Ohio Brass Co., The
Ryerson & Son, Jos. T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Flue.
Ryerson & Son, Jos. T.

Welding and Cutting Apparatus — (See Cutting and Welding Apparatus).

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
Ohio Brass Co., The
Ryerson & Son, Jos. T.

Welding Supplies.
Oxweld Acetylene Co.

Wheels, Cast Iron.
Koppel Industrial Car & Equipment Co.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Company.
Edgewater Steel Co.
Illinois Steel Co.
Koppel Industrial Car & Equipment Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron.
Assn. of Mfrs. of Chilled Car Wheels.
Griffin Wheel Co.
Pressed Steel Car Co.

Wheels, Hand, Push and Motor Car.
Buda Co., The.
Fairmont Railway Motors, Inc.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.

Wheels, Rolled Steel.
Buda Co., The.

Wheels, Steel and Steel Tired.
American Steel Foundries.
Edgewater Steel Co.
Illinois Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Whistles, Locomotive.
American Strombos Co.
Westinghouse Air Brake Co.

Window Fixtures.
Tuco Products Corp.

Wire.
American Steel & Wire Co.
Kerite Insulated Wire & Cable.
Okonite Co., The.

Wire Fence.
American Mond Nickel Co.
American Steel & Wire Co.

Wire, Insulated.
American Steel & Wire Co.
Kerite Insulated Wire & Cable.
Okonite Co., The.

Wire, Rail Bond—(See Rail Bonds).

Wire, Rope.
American Steel & Wire Co.

Wire, Telephone & Telegraph.
American Steel & Wire Co.

Wood, Creosoted.
Jennison-Wright Co.

Wood Preservative — (See Preservative Wood).

Wrecking Cranes — (See Cranes, Wrecking).

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

American Arch Co., Inc..... 62
American Bridge Co..... 89
American Cement Tile Mfg. Co. 92
American Hoist & Derrick Co. 85
American Locomotive Co.... 65
American Mond Nickel Co.... 92
American Sheet & Tin Plate Co. 27
American Steel Foundries..... 7
American Steel & Wire Co... 42
American Telephone & Telegraph Co..... 43
Andrews Steel Co., The..... 41
Armco Culvert Mfrs. Assn. 18, 19
Arnold Engineering Co., The. 93
Associated Business Papers, Inc., The..... 80
Assn. of Mfrs. of Chilled Car Wheels 56

B

Babcock & Wilcox Co., The.. 90
Baker-Raulang Co..... 81
Baldwin Locomotive Works, The 67
Barco Mfg. Co..... 66
Basford Co., G. M..... 59
Battey & Kipp, Inc..... 93
Bixby, Inc., R. W..... 94
Bourne-Fuller Co., The..... 12
Briggs & Turivas, Inc..... 94
Brooks & Co., Clarence..... 86
Buckeye Jack Mfg. Co..... 93
Buda Co., The..... 13
Buffalo Bolt Co..... 90
Buffalo Brake Beam Co..... 91
Buyers' Index..95, 96, 97, 98, 99

C

Camel Sales Co..... 88
Carnegie Steel Co..... 85
Celotex Co., The..... 26
Central Alloy Steel Corp..... 74
Central Coal & Coke Co..... 11
Century Wood Preserving Co. 81
Chipman Chemical Engineering Co..... 29
Clark Car Co..... 92
Classified Advertisements..... 94
Crane Co., The..... 10
Cut-Off & Speed Recorder Corp. 93

D

Day & Zimmerman, Inc..... 93
Differential Steel Car Co..... 90
Duncan Lumber Co..... 24

E

Edgewater Steel Co..... 91
Electric Service Supplies Co... 91
Electro-Motive Co., The..... 91
Exchange Sawmills Sales Co. 6

F

Fairmont Ry. Motors, Inc... 39
Falls-Hollow Staybolt Co..... 92
Ferguson Co., H. K., The.... 83
Fitz-Hugh, Carter H..... 94
Foos Gas Engine Co., The.... 33
Fort Pitt Malleable Iron Co.. 91
Franklin Ky. Oil Co..... 37
Franklin Railway Supply Co., Inc. 60, 61
Fulton Iron Works..... 93

G

Galion Iron Works..... 89
General Fireproofing Co., The 84
Get Together Department..... 94
Gold Car Heating & Lighting Co. 91
Goodwin Side Bearing Co.... 49
Graham Bolt & Nut Co..... 28
Graham-White Sander Corp... 78
Griffin Wheel Co..... 82
Grip Nut Co..... 102

H

Hale-Kilburn Co..... 92
Heywood-Wakefield Co..... 87
Hulson Grate Co..... 75
Hunt Co., Robert W..... 93
Hunt-Spiller Mfg. Corp..... 73
Hutchins Car Roofing Co..... 58
Hyman-Michaels Co..... 94

I

Illinois Steel Co..... 51
Industrial Works..... 4
Inland Steel Co..... 88
International Creosoting & Construction Co..... 2
Irving Iron Works Co..... 83

J

Jennison-Wright Co., The..... 91
Jordan Co., O. F..... 90

K

Kerite Insulated Wire & Cable Co., The..... 87

L

Leader Iron Works..... 93
Lehon Co..... 87
Lima Locomotive Works..... 63
Lockhart Iron & Steel Co..... 76
Locomotive Finished Material Co. 92
Locomotive Firebox Co..... 1
Locomotive Stoker Co..... 69
Lufkin Rule Co., The..... 88

M

McClellan & Junkersfeld, Inc. 93
Magnus Co., The..... 87
Manganese Steel Rail Co..... 92
Marlin-Rockwell Corp..... 84
Midvale Co., The..... 44
Miner, Inc., W. H..... 3
Mississippi Wire Glass Co... 45
Muhlfeld, John E..... 93

N

National Malleable & Steel Castings Co.....53, 54
National Tube Co..... 77
Nelson Mfg. Co., The B. F... 82
Nichols & Bros., Geo. P..... 91

O

Ohio Brass Co..... 14
Ohio Locomotive Crane Co., The 86
Okonite-Callender Cable Co., Inc., The..... 86
Okonite Co., The..... 86
Orton Crane & Shovel Co.... 90
Oxweld Railroad Service Co.. 30

P

P. & M. Co., The..... 90
Pittsburgh Testing Laboratory 89
Pressed Steel Car Co..... 91
Professional Directory..... 93

Q

Q & C Co., The..... 89

R

Rail Joint Co., The..... 38
Railway Educational Bureau.. 94
Railway Steel-Spring Co..... 46
Ramapo Ajax Corp..... 92
Reading Iron Co..... 31
Reliance Mfg. Co., The..... 9
Richards & Wilcox Co..... 32
Robinson & Co., Inc., Dwight P. 101
Ryerson & Son, Inc., Joseph T. 92

S

Safety Car Heating & Lighting Co., The..... 8
Schaefer Equipment Co..... 48
Sellers & Co., Inc., Wm...20, 21
Simmons Boardman Publishing Co. 70
Southern Iron & Equipment Co. 94
Standard Car Truck Co..... 90
Standard Safety Nut Corp.... 92
Standard Steel Works Co...16 17
Stucki Co., A..... 92
Sunbeam Elec. Mfg. Co..... 79
Superheater Co., The..... 71
Symington Co., The..... 15
Syntron Co., The..... 40

T

Timken Roller Bearing Co... 47
Truscon Steel Co..... 86
Tuco Products Corp..... 92

U

Union Draft Gear Co..... 57
Union Metal Products Co..... 55
Union Spring & Mfg. Co..... 92
Union Steel Casting Co..... 92
Union Switch & Signal Co... 32
Universal Draft Gear Attachment Co..... 50

V

Vanadium Corp. of America.. 72
Vapor Car Heating Co., Inc.. 90

W

West Coast Lumber Bureau.. 25
West Disinfecting Co..... 88
Western Wheeled Scraper Co. 92
Westinghouse Air Brake Co.. 68
Westinghouse Friction Draft Gear Co..... 68
Westinghouse Elec. & Mfg. Co. 22, 23
Weston Electrical Instrument Corp. 85
Wheel Truing Brake Shoe Co. 89
Woods & Co., Edwin S..... 92
Worthington Pump & Mchy. Corp. 64
Wyoming Shovel Works....35, 36

Y

Yale & Towne Mfg. Co., The 34

ght-
.... 8
.... 48
,20,. 21
hing
.... 70
nent
.... 94
.... 90
.... 92
..16 17
.... 83
.... 79
.... 71
.... 15
.... 40

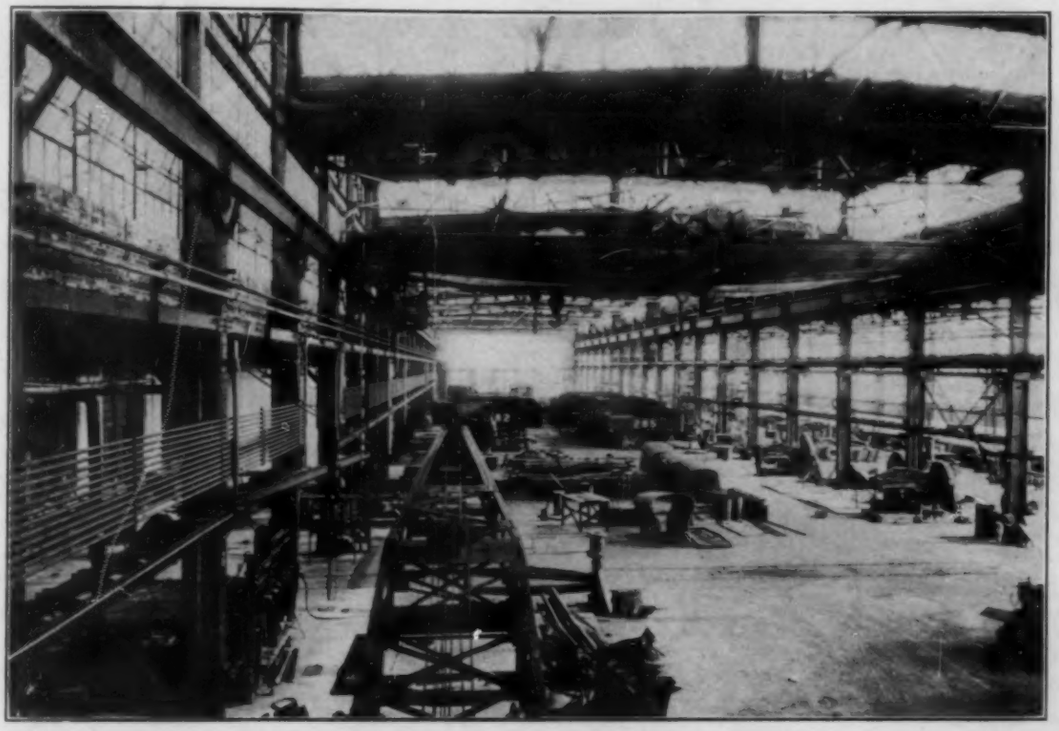
o... 47
.... 86
.... 92

.... 57
.... 55
.... 92
.... 92
.... 82
ch-
.... 80

a.. 72
nc.. 90

u... 25
.... 88
Co. 92
o.. 68
raft
.... 68
ffg.
23, 23
ent
... 85
Co. 89
... 92
by.
... 64
33, 36

The 34



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